Issue #296

OUR 25th ANNIVERSARY YEAR!

May 1985

73 for Radio Amateurs

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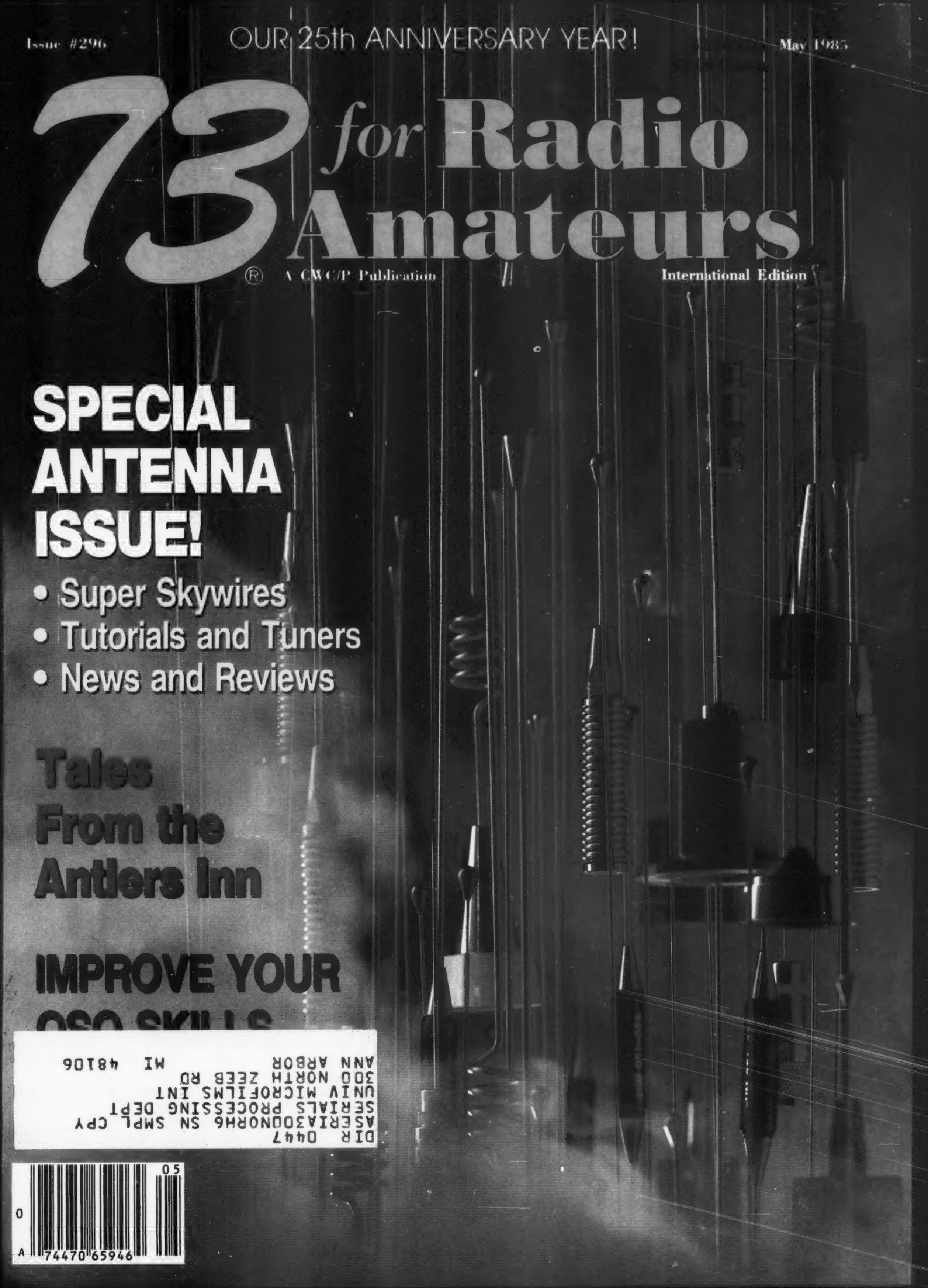

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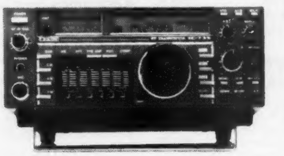

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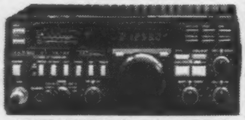

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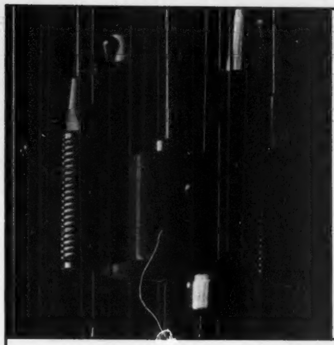

73® for Radio Amateurs

ISSUE #296
MAY 1985

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4 Never Say Die
6 What?
7 QRX
58 Barter 'N' Buy
59 Special Events
62 Satellites
63 RTTY Loop
64 DX
65 Letters
66 Contests
67 Be My Guest
68 Review
70 Fun!
82 New Products
86 *73* International
90 Ham Help
92 List of Advertisers
94 Dealer Directory
94 Propagation

17 Discover the Discone
Is this the perfect aerial? Consider simple wire construction, easy one-time tuning, and flat swr from 3.5 to 28 MHz. W1GV/4

22 Two for Two
We respectfully offer a pair of radiators for the two-meter band so elegant, yet so simple, that you will kick yourself for not thinking of them first. WA4BLC

24 The Snake with LED Eyes
A tall tale from the Antlers—where the decoration is strange and the stories are even stranger. WA8WTE

32 Up, Up, and Array
W6TYH's hybrid collinear will rocket your signal to new heights! W6TYH

38 Good to the Last Dot
Is there life beyond WX HR IS? With these practical tips you'll perk up every QSO and make every contact an adventure! N6HYK

40 Porcupine Mobile
Bristling to work HF from your car? Sport these spikes and hit the road. N2CMU

42 The Rubber Duck Debunked
In ten minutes you can have 10 dB gain over your HT's duckie. It's enough to make you try. W4NVK

44 The No-Baloney Lunchbox
We suggest you paint this antenna tuner before showing it to your friends. KR3T

48 Rotate the Bobtail Curtain
How do you rotate one hundred feet of wire antenna? It's simple: Just flip the switch. W8HXR

50 Alligatored Antennas
(clip) It's 30m...(clip) it's 17m...(clip) it's 12m. Get the idea? W0MBP

52 Zuper Zepp for VHF
Zip up your zignal with UZM's planz! WA4UZM

54 Phase the Nation
North, south, east, or west, you'll be on target with the double-X trapped-vertical array. KB2XX

56 Where Am I Pointed?
Is this Sinclair beam-aimer program just like every other? Guess again. AD1B

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W2NSD/1

NEVER SAY DIE

editorial by Wayne Green

ANTENNAS

Articles on antennas have always been a ham favorite—and for a good reason. It's been a couple of generations since our ham transmitters and receivers were simple enough for the average ham to build, but anyone can still design and build an antenna.

Even when I first got started with amateur radio, 45 years ago, few hams were building their own receivers. I used to go all over Brooklyn visiting the hams I heard on the air, and only one had a homemade receiver. Oh, I built one—a reader sent me one of my SWL cards listing it recently—but as soon as I had the money, I bought a Hallicrafters SX-20—the Sky Champion.

Since there were far too few hams to support a manufacturer before the war, it wasn't until after WWII that the first relatively low cost commercially-made ham rigs began to appear. Once rigs could be bought, few hams bothered to build 'em again. Oh, that didn't stop hams from building gadgets, RTTY terminals, and so on, just transmitters and receivers.

Many of the experimenters headed for the VHFs, but Gonset and Heath pretty much put an end to that with commercially-made VHF rigs.

Through all of this the ham love affair with antennas has continued. Oh, not many hams understand the antenna engineering, but that doesn't stop most of us from whipping out a back issue and a soldering iron and putting something together to test. We're all in search of the ideal antenna.

I've a little secret—I've hit the antenna jackpot a couple of times down through the years. I remember when I was at college after the war. I'd taken over the basement of the fraternity house with my two kilowatt rigs, my SX-28A, and a National receiver. *CQ* had published an article on a Twin-Three antenna (also called a Twin-Triplex), so I plunged out into the yard and put four of them together in the snow—two for twenty meters and two for ten. We had about four feet of snow in the yard, so every time I put down my soldering iron it would melt out of sight.

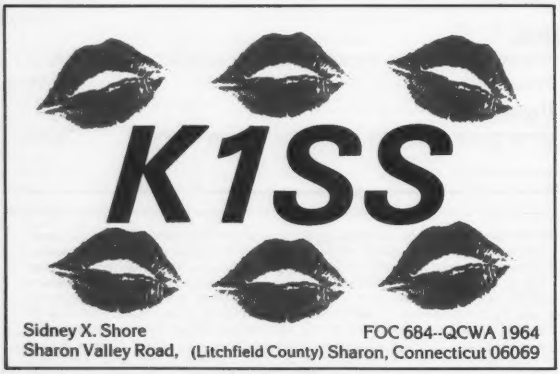
The Twin-Three was a wire beam with two three-wire dipoles spaced a sixth wave apart. Both dipoles were fed with twinlead. This meant I had to run 30-foot-long wires between two ten-foot-long 2" × 2" boards, put an insulator in the center, solder the wires together at their ends, and hang the whole works between a tree and the fraternity house. It took two antennas for each band because there wasn't any way to rotate them and each was bi-directional.

I finally got the whole works put together and up in the air. I hooked them to relays to switch directions and bands. They worked beyond all my dreams. The Twin-Three antenna has a very narrow vertical angle of radiation and a wide horizontal angle, so I was able to reach most of the world just by switching antennas.

The narrow vertical angle meant that my signal would be very powerful at one spot and then move on. I had to learn to keep my contacts short. The angle was particularly low, so most DX stations would tell me that I was the only US station coming through. When most other ops were talking with England, I was working Germany. When their signals would start being heard in Germany, mine were fading out and Italy was calling.

I remember one morning

Continued on page 63



Sidney X. Shore — FOC 684--QCWA 1964
Sharon Valley Road, (Litchfield County) Sharon, Connecticut 06069

QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, 80 Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

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KENWOOD

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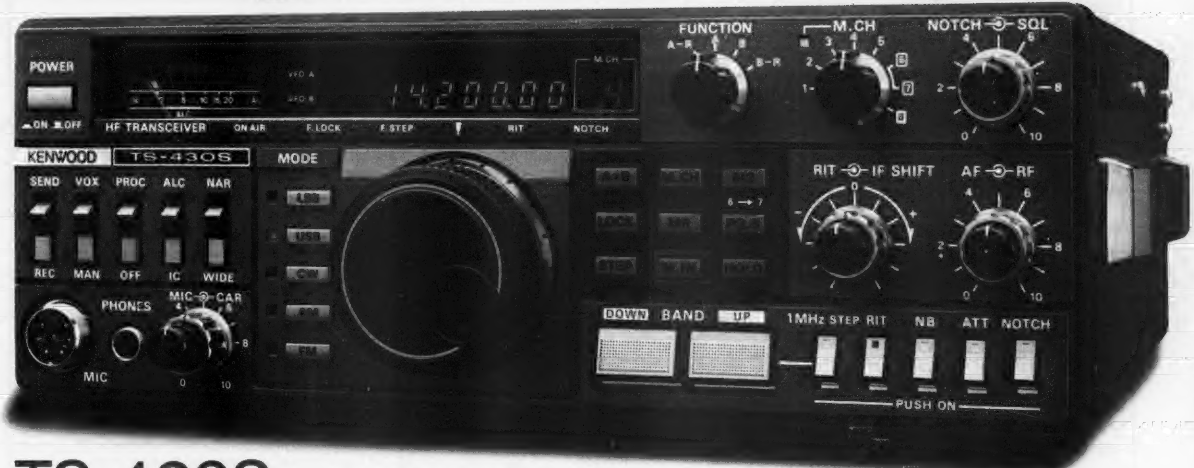
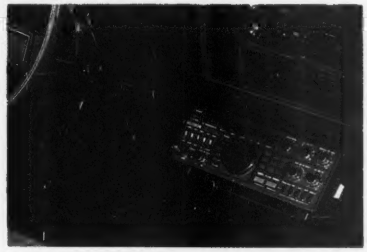
"Digital DX-terity!"



TS-430S

Digital DX-terity—that outstanding attribute built into every Kenwood TS-430S lets you QSY from band to band, frequency to frequency and mode to mode with the speed and ease that will help you earn that dominant DX position from the shack or from the mobile!



- **Covers all Amateur bands** 160 through 10 meters, as well as the new 30, 17, and 12 meter WARC bands. High dynamic range, general coverage receiver tunes from 150 kHz to 30 MHz. Easily modified for HF MARS operation.
- **Superb interference reduction** Eliminate QRM with the IF shift and tuneable notch filter. A noise blanker supresses ignition noise. Squelch, RF attenuator, and RIT are also provided. Optional IF filters may be added for optimum interference reduction.
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- **Memory channels.** Eight memory channels store frequency, mode and band data. Channel 8 may be programmed for split-frequency operation. A front panel switch allows each memory channel to operate as an independent VFO or as a fixed frequency. A lithium battery backs up stored information.
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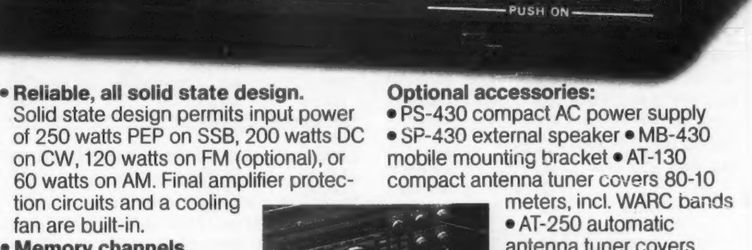
- **Dual digital VFOs.**
- **VOX circuit, plus semi break-in with sidetone.**

Optional accessories:
• PS-430 compact AC power supply • SP-430 external speaker • MB-430 mobile mounting bracket • AT-130 compact antenna tuner covers 80-10 meters, incl. WARC bands • AT-250 automatic antenna tuner covers 160-10 meters, incl. WARC bands • AT-230 base station antenna tuner • FM-430 FM unit • YK-88C (500 Hz) or YK-88CN (270 Hz) CW filters • YK-88SN (1.8 kHz) narrow SSB filter • YK-88A (6 kHz) AM filter • MC-42S UP/DOWN hand mic. • MC-60A deluxe desk mic., with UP/DOWN switch • SW-2000 SWR/power meter • SW-100A SWR/power/volt meter • PC-1A phone patch • HS-4, HS-5, HS-6, HS-7 headphones



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Complete service manuals are available for all Trio-Kenwood transceivers and most accessories. Specifications and prices are subject to change without notice or obligation.

WHAT?

News from the Publisher

This will be bad, sad news for doters on doom and gloom for amateur radio. We do need to grow—there's no question about that. There's a lot of work to be done—to think otherwise would be carrying naivete to its extreme. But is ham radio '85, right now, today, alive and well and stronger than most people think? YES. With a better future than most people predict? YES, YES, YES.

Am I guessing? No. What if YOU wanted to check out the real health of amateur radio in the United States today? What if you wanted to find out how hams really feel? Would you take a poll by mail? No. Would you call people up and talk with them—at times for almost an hour? YES. And that's what we did. And what we found out was not just interesting, but also very, very heartwarming.

Systematically at random (so that every call area would be proportionally represented), we selected 100 calls from the *Callbook*. We called information to get their phone numbers. Then, for almost two weeks, we tried to reach them. It took 188 calls before we were through. Here's part of what happened: Five numbers were tried five times each with no answer. We reached the families of three Silent Keys. Ten selectees were away or were just flat out unreachable (e.g., "in Australia, don't know where"). Six people reached preferred not to take part. So as it turned out, 76 people (not just *73* subscribers, I should emphasize) volunteered to share their thoughts about amateur radio.

The ground rules were simple: Tell the truth. We never volunteered the fact that *73* was calling. If asked, though, we immediately explained who we were. 67.4% of the people reached didn't even ask. Almost everyone was excited to have the opportunity to speak up on behalf of his hobby. 72.6% turned down the offer of a letter confirming the confidentiality of their conversations, and 92.1% definitely wanted to be part of a follow-up survey sometime later this year.

What did we talk about? Mainly about operating habits and buying plans, but also about magazines and microcomputers. As this is being written, the compilation of results stands at 26 pages and counting/mounting. During the coming months, we'll certainly be sharing with you this information about who '85's hams really are and how they really think. In the meantime, you might like to know that 46.1% of you belong to a local amateur-radio club or organization and that 89.5% of you could get on the air right now, this second. And amateur radio is a dying service?

I'd like to say thank you, in a very cryptic way, to the 76 people who were kind and caring enough to share their time with us. They're listed below, but since total confidentiality was assured, only the second-to-last letter of their last names and the second-to-last letter of their calls are shown. The footnotes are hints for duplicates—just so they know they weren't forgotten.

A/E
A/G
A/K
A/N
A/O
C/R
D/K
E/E (1)
E/E (2)
E/H
E/J
E/K (3)
E/K (4)
E/K (5)
E/L

E/N
E/O
E/Q
E/R (6)
E/R (7)
E/S
E/Y
F/D (8)
F/D (9)
F/X
G/T
I/E
I/H
I/I
I/O

I/Y
K/E
L/B
L/S
L/T
L/W (10)
L/W (11)
M/I
M/O
N/C (12)
N/C (13)
N/N
N/T
N/V
O/A

O/B (14)
O/B (15)
O/K
O/M
O/N
O/P (16)
O/P (17)
O/P (18)
O/R
O/S (19)
O/S (20)
O/W
P/G
R/D
R/G

R/I
R/M
R/W (21)
R/W (22)
S/Q
S/U (23)
S/U (24)
T/D
T/E (25)
T/E (26)
T/F (27)
T/F (28)
T/G
T/H
T/O

(1) Ford Driver
(2) Electronics Prof
(3) Ella
(4) ZIP Code totals 20
(5) Port of NY
(6) Club Notes Only
(7) Ups and Downs
(8) ZIP Code totals 11
(9) Port of FL
(10) Up the Creek
(11) ZIP Code totals 24
(12) ZIP Code totals 9
(13) Trail Drive
(14) Cardinal Call

(15) ZIP Code totals 18
(16) The Alamo
(17) Held for Ransom
(18) For the East Trees
(19) Prince?
(20) ZIP Code totals 14
(21) Rocky
(22) ZIP Code totals 20
(23) WWV
(24) ZIP Code totals 24
(25) Halfway I
(26) A Dud
(27) Halfway II
(28) IBM Loafer

Finally, two stories. One person I reached was the XYL of a Silent Key. "G" is one of the nicest people you would ever want to talk with and also one of the greatest supporters of amateur radio and the code. And the code. And the code. After we had spoken for quite a while, she mentioned that she had had a relative involved with code in the early days. I took a chance and asked her if she would mind telling me her maiden name. "Not at all," she said. "Morse."

And then, for those of you who counted our thank-you's, there is #76—the last person reached and the only way our survey was skewed. Standard methodology says that you try five times and then quit. But this was the last MIA after 13 days and nights of calls by Hope Currier and Chris Schmidt and Perry Donham and me, so I said heck, we'll give him a sixth shot. Plus, he's a pickle trucker, which I thought might qualify him for some sort of a break. I left a message with his daughter: If he's interested, have him call me collect at home between 6:00 and 8:00 EST on Sunday. The time came and went, and the survey was at last finished. And then, at 10:05, the call came, "I'm sorry I couldn't get back to you sooner. I've been on the road all week. I'd be glad to take part in the survey, but I hope you understand that I'm just a Novice. Is that alright?" Be still, my heart.

Jack Burnett

73 for Radio Amateurs is a member of the CW Communications/Inc. group, the world's largest publisher of computer-related information. The group publishes 52 computer publications in 24 major countries. Nine million people read one or more of the group's publications each month. Members of the group include: Argentina's *Computerworld/Argentina*; Asia's *The Asian Computerworld;* Australia's *Computerworld Australia, Australian Micro Computerworld, Australian PC World* and *Directories*; Brazil's *DataNews* and *Micro-Mundo*; China's *China Computerworld*; Denmark's *Computerworld/Danmark* and *Micro Verden*; Finland's *Mikro*; France's *Le Monde informatique, Golden* (Apple) and *OPC* (IBM); Germany's *Computerwoche, Microcomputerwelt, PC Welt, Software Markt, CW Edition/Seminar, Computer Business* and *Commodore Magazine*; Italy's *Computerworld Italia*; Japan's *Computerworld Japan* and *Perso ComWorld*; Mexico's *Computerworld/Mexico* and *CompuMundo*; Netherland's *CW Benelux* and *Micro/Info*; Norway's *Computerworld Norge* and *MikroData*; Saudi Arabia's *Saudi Computerworld*; Spain's *Computerworld/Espana* and *MicroSistemas*; Sweden's *ComputerSweden, MikroDatorn, Min Hemdator* and *Svenska PC World*; the UK's *Computer Management, Computer News and Computer Business Europe*; the US's *Computerworld, HOT CoCo, inCider, Infoworld, MacWorld, Micro Marketworld, PC World, RUN, 73* and *80 Micro.*

QRX. ▪ ▪

EDITED BY PERRY DONHAM KW1O

Say Again?

HAVE YOU EVER transmitted with excessive power? You know, that time the rare DX was on and "just a few more Watts" helped you break the pileup. Of course, we all have heard of the California Kilowatt, but now a new definition has arisen—the "Texas Triplewatt!" **Jerry Dyke WB5LEU** was caught driving a Drake linear with his Collins S-line. The *linear* was driving a **3CX10000T** with a rating of about *48,000 Watts!* Jerry was running a "conservative" 25 kW in the Novice band, allegedly in retaliation for harassment by other hams on 3895 kHz. Jerry, whose station had been monitored by the FCC's Houston Field Office, was fined $2000 for the infraction.

73 On Line

THE *73* BULLETIN BOARD is now on line! Currently running on a Leading Edge microcomputer, the BBS supports 300 or 1200 baud and offers text files and software to download, a place to upload your own files, current bulletins, news from the world of ham radio, and a personal mail system. You can upload letters to the staff, "Ham Help" requests, or even articles for us to review! Try it out—the BBS is on from 2200 to 1200 UTC weeknights, and all day Saturday and Sunday. The number is (603)-924-9809.

Pirates

SPEAKING OF BULLETIN BOARDS, the **Association of Clandestine Radio Enthusiasts** has set one up with information about unofficial and pirate radio stations and extracts from ACE's monthly magazine. A personal mail system is also offered. The BBS, which supports 300 or 1200 baud, may be reached 24 hours a day at (913)-677-1288.

Sky High

THE NEXT HAM-IN-SPACE FLIGHT is scheduled for later this year. Astronaut **Tony England W0ORE** will be aboard the 51F mission of the orbiter *Challenger*, carrying as much amateur gear as he can. Tony says that groups or individuals wishing to work him during the flight should contact the ARRL, as it is acting as a clearing-house for the requests. Tony will concentrate on keeping schedules with school classrooms and radio clubs. The original ham in space, **Owen Garriott W5LFL,** will be back in space on a mission coming up next year.

Mr. Ed

NEW YORK MAYOR Ed Koch was exposed recently to amateur radio by a group of students from **Junior High School 22** on Manhattan's Lower East Side. The youngsters, who had just completed a period of English via Ham Radio, were calling CQ on their favorite frequency, 21.395 MHz. John WA9YHW/HR, off the coast of Honduras, answered the call. John is an old friend of the class, and asked for a favor. "Call up my friend Ed. . . and tell him his friend John from Westhampton Beach wishes him the best of luck. . ." Undaunted by the enormity of the task, the group rang up the Mayor's office. It took careful explanation of ham radio by the students, but the Mayor's secretary finally promised to deliver the message. A few days later, the class received a personal note from Mayor Koch thanking them for their relay and expressing an interest in observing their program.

Grab Bag

WE'RE GIVING AWAY the entire United States! Recently a box surfaced in the W2NSD shack that contained scads of giant **Worked All States Maps.** Well, maybe not *giant*, but certainly very large. All right, they're 17″ × 11″. That's *pretty* big. If you would like one of your very own (while they last), drop a big SASE in the mail to *73* Magazine, 80 Pine Street, Peterborough NH 03458, Attn: Giant Map. We've also got plenty of the wonderful 10-meter beacon lists. Save a stamp and ask for them both!

SWL Society

SHORTWAVE LISTENERS, hams, and other radio enthusiasts are invited to join the **Great Circle Shortwave Society.** The GCSS feels that the 1950s and 1960s were fascinating years in the world of shortwave, and publishes a newsletter devoted to the period. Special emphasis is placed on SWLs who were active during the period between the Korean War and the Vietnam War, and who hold *Popular Electronics* "WPE" shortwave-monitor callsigns. For a sample newsletter and information about GCSS, send an SASE to Richard Arland WPE7BYR, Secretary, Great Circle Shortwave Society, 2042C Flyer Drive, Bethel Manor, Langley AFB VA 23665.

The crew at JHS 22.

Thus Spake Drake

EVEN THOUGH R. L. DRAKE no longer makes amateur-radio equipment, that doesn't mean that they can't service your gear. According to **William Frost WD8DFP,** Service Manager for Drake, "While it is true that the company has curtailed its manufacture of amateur-radio products, it is not true that the company does not exist! The service department still provides service and overhaul on any R. L. Drake Company product ever made and will continue to do so until unique parts for [a] product are no longer available, or the cost of repair exceeds the value of the product." Drake is still at 540 Richard Street, Miamisburg OH 45342, and you can call Drake at (513)-866-3211.

Homebodies

CHRIS ANDERSON KA8RJY wrote in to alert everyone about his **National Homework Net (NHN).** Chris says, "I'm fourteen and am Net Manager for the NHN, which meets every Saturday night at 0100 UTC on 3.870 MHz. We need to be exposed to the outer world and would greatly appreciate a small tidbit that maybe would gather some more teen amateurs to our net." How about it, gang? Why not drop in on Chris and the NHN? Or you can write to Chris at 085 Walker Road, Jackson OH 45640. Tell him "QRX" sent you.

Well?

WHAT DO YOU THINK? I hope you've noticed the changes we've made in *73.* We try to be as flexible as possible to make this *your* magazine, but we need to know what *you* want to see. Would you like more construction articles? More humor? Articles on DX and operating? Or maybe you have an idea for a new column or feature. You may even like things just the way they are.

Let us know—jot down your thoughts on a card and drop it in the mail. The address is *73* Magazine, 80 Pine Street, Peterborough NH 03458. Remember, the name is *73 for Radio Amateurs*...that means *you*!

Ham Fam

CAN YOU TOP THIS? We recently received a letter from **Nellie Myers KA9DVY**, editor of *The Dam Paper*, journal of the Tri-County Amateur Radio Group, describing the Johnson family. On the surface, the Johnsons look like ordinary folk, but *all seven* of them are hams! In the photo are (front row) the Reverend Johnson W0KPS and his wife Doris KA9RTK, (back row, left to right) Nancy KA9TAR, Thomas KA9RRL, Greg KA9RRN, William WB0YNL, and Sheryl KA9RRM. Quite a group! I wonder if there's a waiting list to use the rig?

XKGP7QTMP!

ALPHABET-SOUP SYNDROME continues to plague the amateur bands. If you are baffled by the strange prefixes you've been hearing, the following information should serve to confuse you even further. Corsica is now TK and French Antarctica is FT. Inside France, the first letter will still be F, but a second letter has been added to designate the license class in these categories: A—minimum age 13, no-code exam, 144 MHz only; B—minimum age 13, 144 MHz with a few CW segments on 10-40 meters and voice on 28.4 to 29.0 MHz; C—minimum age 16, no-code exam, 30 MHz and up; D—minimum age 16, all privileges; E—class-D hams with 3 years experience. In overseas departments and territories of France, the number in the callsign will change—1 becomes 3; 7 or 8 with less than 3 years in that class becomes 4; 5 indicates a license held for 3 years. Say what?

Prefix Fix

PREFIX HUNTERS will have a chance to work three special Canadian calls during the celebration of the 100th anniversary of the **Canadian National Parks System.** From June 29th to August 29th, you'll hear XO for VO, XJ for VE, and XK for VY.

Lifers

HOLDERS OF FCC COMMERCIAL TICKETS are now eligible for the new Lifetime Operator License. If you hold an FCC First Class, Second Class, or General Radiotelephone certificate, you automatically qualify. Send your request, including your name (as it appears on the license), your date of birth, and your license number, to the FCC Field Office that issued your ticket. Write "Lifetime License" on the envelope, and enclose an SASE. Enclose a *big* SASE if you don't want your certificate folded.

The Johnson family portrait.

Packet Places

ARE YOU WONDERING if there is any packet-radio activity in your area? Here are a few frequencies (in MHz) that you can listen on to hear some of the action: Annapolis 10.147, Atlanta 146.13/.73, Baltimore 145.01, Chicago 144.95, Colorado Springs 147.50, Dallas 147.57, Denver 145.70, San Francisco 146.58, St. Louis 147.555, Washington DC 145.01, Eastnet 145.01, Pacific Northwest 146.55, and 145.36 in Southern California. Packet sounds like flies having a chat.

Foxy

IS CHASING FOXES your idea of a good time? If so, let us know. *73* is working on a super fox hunt that would begin with competition at the local level, then advance to a regional contest. The best team in each region would assemble for a national fox hunt to determine the best DF team in the country. We are looking for comments and suggestions on every aspect of the trial, including rules, frequencies, and standard equipment. Send your input to *73* Magazine, 80 Pine Street, Peterborough NH 03458, Attn: Fox Hunt.

Crash! Bang!

ELIMINATE RF COLLISIONS between terrestrial and space communications by avoiding our satellite passbands. AMSAT urges all amateurs to reserve 29.3–29.5, 145.8–146.0, and 435.0–435.5 MHz for amateur satellite work. Remember, satellites can't easily QSY—we can.

QSL?

HAVE YOU WORKED 4W1CW, YN1Z, YN1CW, H7Z, or TG9XGV? Here's a word from the manager. "USPS notified us this week that the address to which we sent all QSLs is now obsolete; the operator of those stations has moved and left no forwarding address. Possibly we can locate him at a different QTH, but for now we are holding all incoming QSLs for these callsigns." Can anybody help? The fellow's handle is Gun, and he works high-speed CW. Send your information to Bill Wellborn K4CLA, 562 Oak Drive, Lexington SC 29072.

Caveat

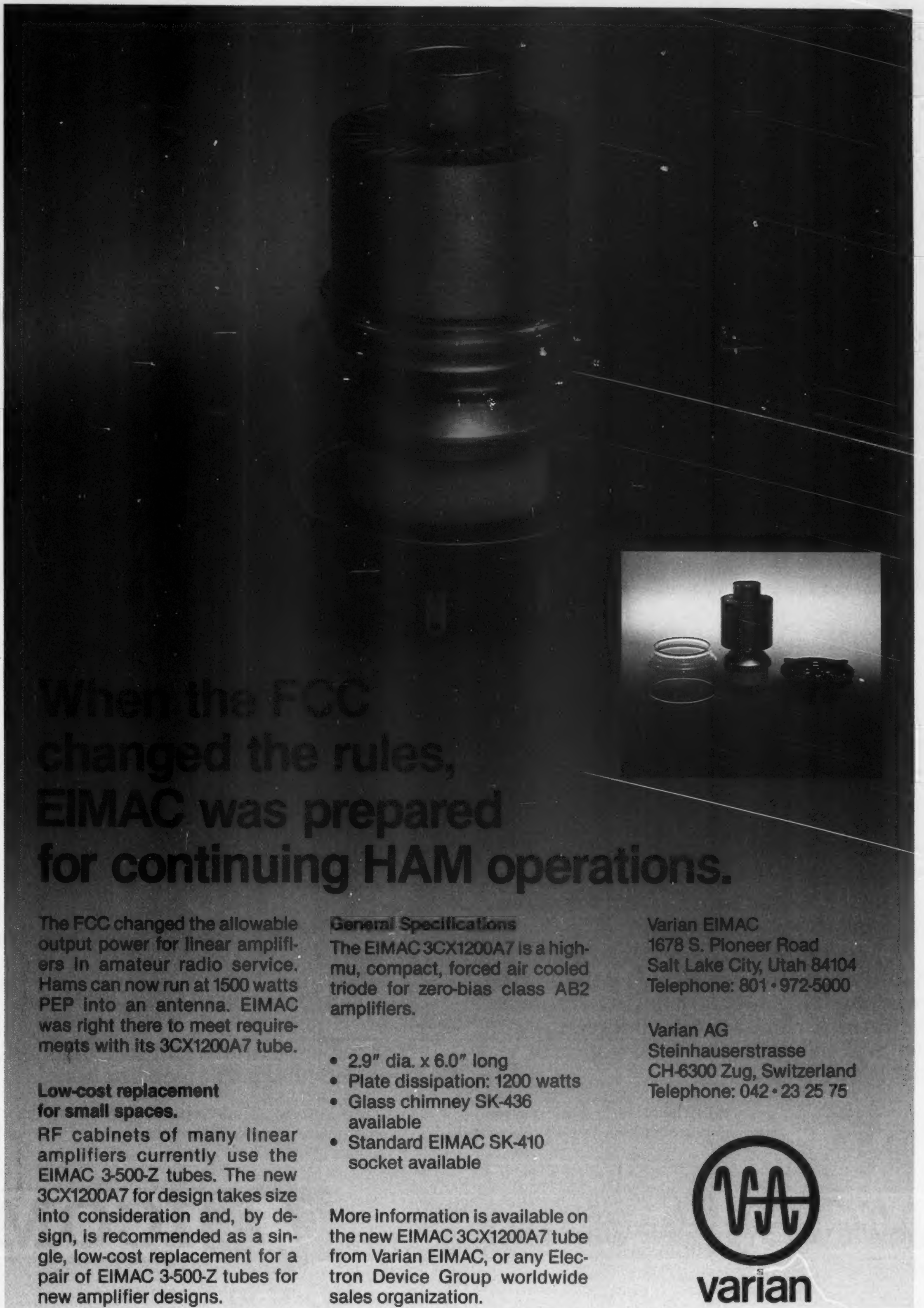
IF YOU'VE PURCHASED a Yaesu FT-757GX for what seemed a "bargain-basement" price, you may be in for a few headaches. In an interview appearing in the *W5YI Report*, **Bob McKay N8ADA** said, "...there are Yaesu 757GX radios being sold that are not the same as the 757 models being advertised nationally. The radios are identical in appearance but do not have the CW filter, will not work on the new WARC bands, and cannot be serviced in the USA." Bob is the editor of *The Carrier*, journal of the Dayton Amateur Radio Association. It looks as though someone has imported transceivers intended for sale only in Japan. The radios may have been illegally imported, but they could be legal since most amateur gear does not require type-acceptance by the FCC. The shipping crates have markings on them indicating that the rigs may only be serviced in Japan. Chip Margelli of Yaesu has indicated that service and repair can be done in the US, but the warranty is not valid here in the States. In any case you should be wary of a deal that seems to be too sweet.

Knock, Knock

A GOLDEN OPPORTUNITY awaits the right person! **Ham Radio Outlet** is looking for someone to manage a new amateur-radio store in the New England area. HRO is an established company in the ham-radio industry and offers a great employee-benefit package. The manager/trainee will spend time in California learning his or her job. If this sounds like something you would like to do, send your resume to Bob Ferrero at Ham Radio Outlet, 2620 West La Palma, Anaheim CA 92801.

Hot Pix

DO YOU HAVE A PHOTO that would look good on the cover of *73*? We're always in the mood for a great picture. Send your shots in for evaluation! The pictures should be vertical, like the cover, and should have a nice space in the upper left corner to tuck our logo. We prefer large-format transparencies, but we'll also consider high-quality 35-mm slides or color prints. Forward your photos to *73* Magazine, 80 Pine Street, Peterborough NH 03458. Enclose an SASE if you'd like your pictures returned.



When the FCC changed the rules, EIMAC was prepared for continuing HAM operations.

The FCC changed the allowable output power for linear amplifiers in amateur radio service. Hams can now run at 1500 watts PEP into an antenna. EIMAC was right there to meet requirements with its 3CX1200A7 tube.

Low-cost replacement for small spaces.

RF cabinets of many linear amplifiers currently use the EIMAC 3-500-Z tubes. The new 3CX1200A7 for design takes size into consideration and, by design, is recommended as a single, low-cost replacement for a pair of EIMAC 3-500-Z tubes for new amplifier designs.

General Specifications

The EIMAC 3CX1200A7 is a high-mu, compact, forced air cooled triode for zero-bias class AB2 amplifiers.

- 2.9″ dia. x 6.0″ long
- Plate dissipation: 1200 watts
- Glass chimney SK-436 available
- Standard EIMAC SK-410 socket available

More information is available on the new EIMAC 3CX1200A7 tube from Varian EIMAC, or any Electron Device Group worldwide sales organization.

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Reach Out To Your Friends With The IC-751

Here's what other hams have to say about the "dream rig."

"To put it concisely, the IC-751 easily meets all of its advertised claims with regard to technical specifications."

"The filters used on the IC-751 are about the sharpest one can imagine."

"It performed flawlessly over the entire period. Particularly if the IC-751 is used with an internal power supply, it has to be regarded as the most compact, full-featured transceiver available for either fixed station or portable operation."

John J. Schultz W4FA
CQ Magazine
September 1984

"...we seriously doubt anyone finding a unit superior to ICOM's new 751 HF 'dream rig.'"

Dave Ingram K4TWJ
Computer Trader Magazine
September 1984

"The general-coverage receiver is excellent."

Mark Wilson AA2Z
QST Magazine
January 1985

"The Notch measured 55dB, and is the best ICOM Notch yet."

"The stability of the 751 deserves mention. We measured 10Hz drift in the first hour."

Robert Pohorence N8RT
International Radio, Inc.
September 1983

Now with a ONE YEAR Warranty!

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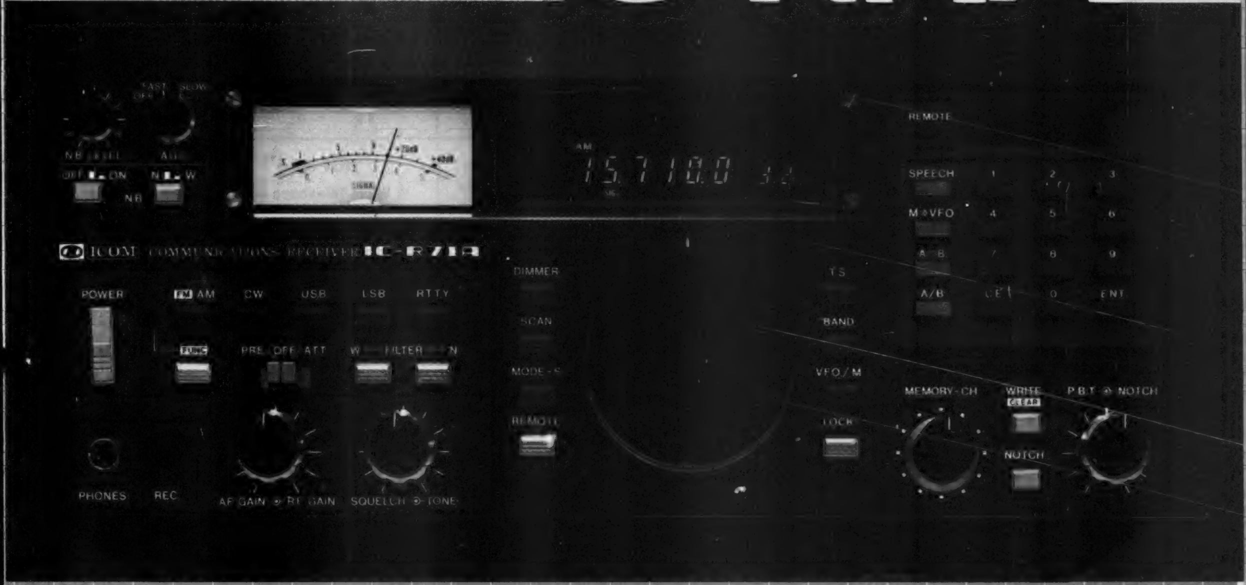
All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 751285

ICOM HF Receiver

IC-R71A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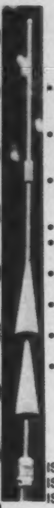

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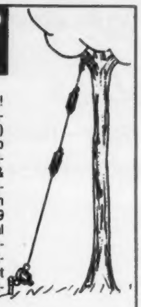

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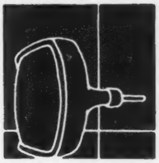

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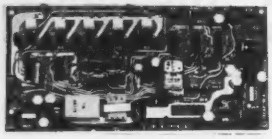

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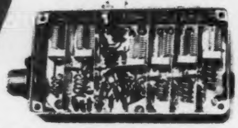

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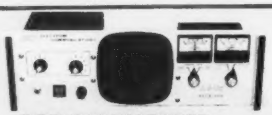

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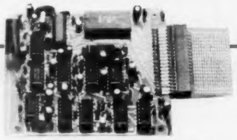

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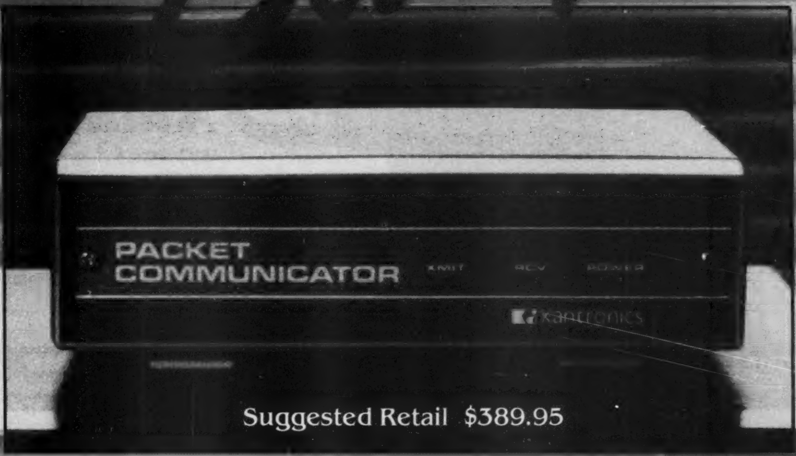

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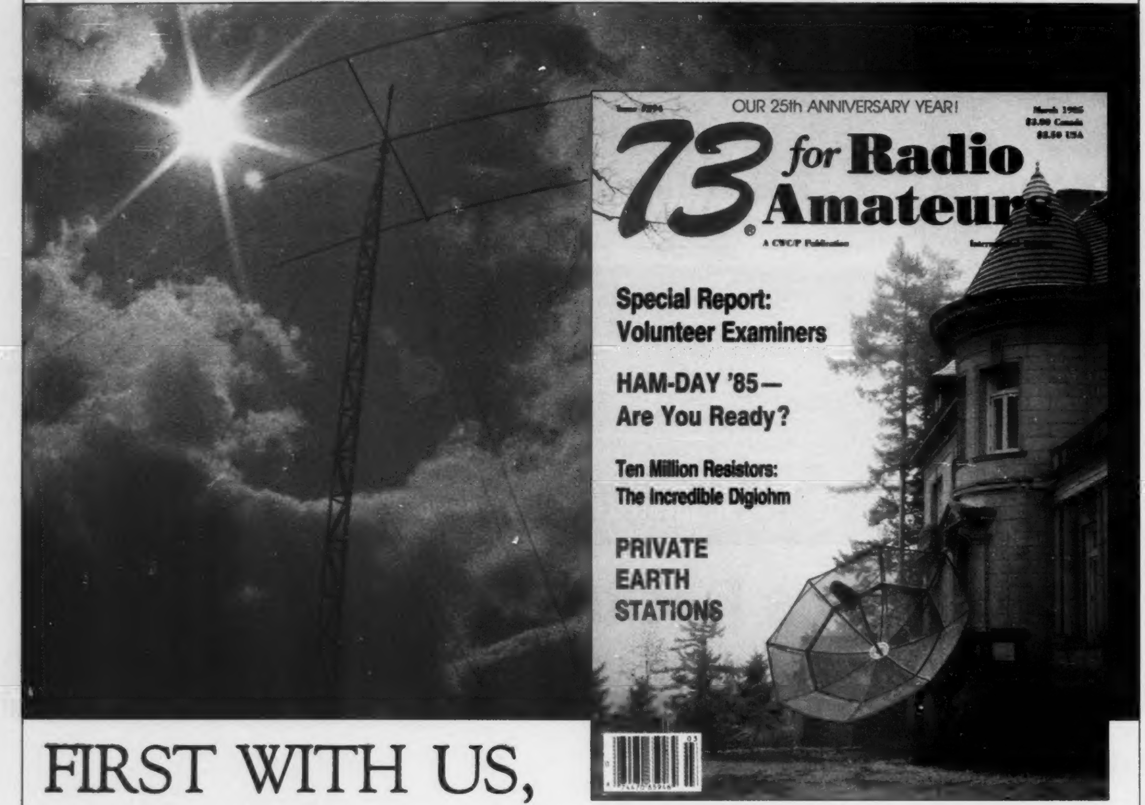
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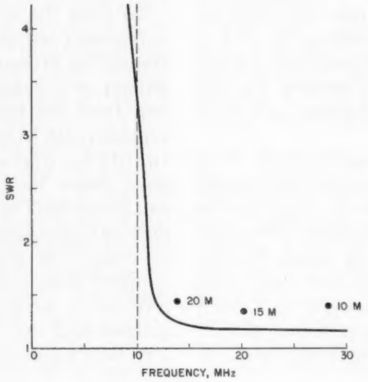

Fig. 1. Swr vs. frequency for a discone antenna having a cutoff frequency of 10 MHz (dotted line). The points show the results of a test at W1GV/4 using the antenna described in this article. Any swr less than 3 was considered tolerable.

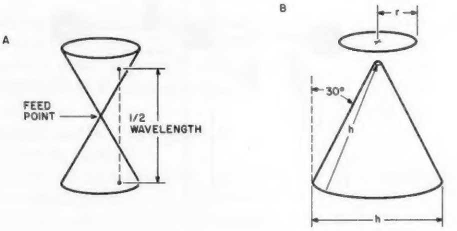

Fig. 2. Design of a bi-conical antenna (A) and a discone (B). The discone is a modified bi-conical antenna, in the same way an inverted ground-plane antenna is a modified vertical dipole.

This article describes the theory, design, and construction of a broadband vertical for the range 10 through 30 MHz. This antenna is an adaptation of a technique usually seen only at VHF: the discone. This antenna displays vertical polarization and excellent low-angle radiation; it needs no radial system, and it has a fairly flat, low swr curve over a continuous frequency range. A theoretical swr response is illustrated in Fig. 1.

Theory

The concept of the discone originated with the notion that if an antenna could be constructed whose dimensions were specified by angle measures only, then it would function independently of the wavelength. The bi-conical antenna (A in Fig. 2) is one such device. If the two cones extend sufficiently above and below the feedpoint, then resonance can exist at any frequency above f_{min}, where the altitudes of the cones are 1/4 wavelength. The electromagnetic field flows outward from the feedpoint along the surfaces of the two cones until it reaches points separated by 1/2 wavelength, as shown. Clearly, this will be possible at any frequency larger than f_{min}, provided the vertices of the cones come together precisely at the feedpoint.

As the frequency is moved below f_{min}, it is no longer possible to find two points on the cone surfaces separated by 1/2 wavelength in space. Consequently, the swr increases rapidly. When the frequency is lowered so that the slant height, h, of each cone is equal to 1/4 wavelength, we say that the bi-conical antenna is at f_c— its cutoff point. The swr at cutoff varies depending on the vertex angle of the cones. Below f_c, the swr rises with extreme steepness to prohibitively high values. Thus the bi-conical antenna represents an electrical high-pass filter with a lowest practical frequency of f_c.

A bi-conical antenna obviously presents structural problems at high frequencies although it is perfectly practical at VHF. To reduce the physical size of the antenna, the discone was developed. Either the top or bottom cone may be replaced with a reflecting radial system, and then the antenna will function over the same frequency range (provided the reflector is large enough). If we replace the lower cone with a radial system and bring the feedpoint to ground level, we have an antenna known as a conical monopole. By replacing the top cone with a reflecting disk of sufficient size (B in Fig. 2), we obtain the discone. The discone is to the bi-conical as an inverted ground-plane antenna is to a vertical dipole.

The discone is easier to build than a conical monopole primarily because no ground radial system is necessary. The high-current portion of the antenna is elevated above ground. The disk radius need be only about 1/12 wavelength at the lowest usable frequency, f_c.

Design

The antenna gets its name from the fact that it consists of a disk on top of a cone. The disk radius, r, is 0.08 wavelength at the cutoff frequency, f_c, and the slant height, h, is 0.24 wavelength. These dimensions are free-space values.

Above f_c, the swr drops from about 3.5 to almost a perfect match at f_{min}. In theory, the swr then remains nearly constant for several octaves. Above about the third harmonic of f_c, the maximum radiation begins to occur at considerable elevations above the horizontal; however, between f_c and $3f_c$ the radiation angle is very low and therefore is excellent for DX work.

At 10 MHz, 0.08 wavelength in free space is 7 feet 10 inches, and 0.24 wavelength is 23 feet 8 inches. The slant height of the cone is equal to the base diameter, making the pitch of the cone 30 degrees from the vertical. This value is not, however, particularly critical. Discones may be built with considerably larger or smaller vertex angles. The value of 30 degrees was chosen since it appears to be the most common value in discone design.

At VHF, discones usually are made from solid metal or screen. For a discone with f_c = 10 MHz, this would obviously be ridiculous. However, a wire cage will work very well at longer wavelengths provided the separation between the wires is small. The design scheme for the 10-to-30-MHz discone is shown in Fig. 3. A suggested list of parts is given.

Initial Construction

The center support mast for the HF discone is 23 feet 6 inches high. Aluminum tubing works very well for this purpose and is available in most hardware stores. Three eight-foot sections may be used, overlapping three inches at the junctions. The top section is one-inch O.D., the center section 7/8-inch O.D., and the bottom section one-inch O.D. The sections are best secured by slitting the end of the larger piece with a hacksaw and clamping the two sections together with hose clamps.

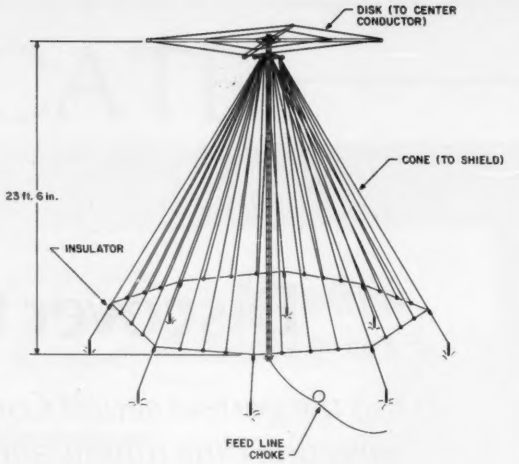

Fig. 3. Construction of the 10–30-MHz discone. The slant height is 23 feet, 8 inches; the square disk has a diagonal radius of 8 feet. The supporting mast is 23 feet, 6 inches high.

The cone consists of 32 lengths of wire. Uninsulated no. 22 wire is a good choice for this purpose. The wire need not be heavy; in fact, heavy wire will make construction very difficult. Each wire is approximately 23 feet 8 inches long and slants down at an angle of about 30 degrees with respect to the vertical mast. All the wires are joined at the base of the cone with an octagonal ring.

To form the base of the octagonal cone, eight stakes should be driven into the ground at a distance of 15 feet from the base of the support mast. (A ninth stack should be placed at the point where the mast base will be located, so the mast may be slipped over it when erected.) The eight cone-support stakes should be uniformly arranged in a manner such that lines from any two adjacent stakes

f_c, MHz	Bands covered, M	r, ft.	h, ft.	Mast*
3.4	80, 40, 30, 20, 17, 15, 12, 10	23.1	69.5	65
6.9	40, 30, 20, 17 15, 12, 10	11.4	34.2	33
10.0	30, 20, 17, 15, 12, 10	7.9	23.7	23
13.7	20, 17, 15, 12, 10	5.7	17.1	17
17.9	17, 15, 12, 10	4.4	13.2	13
20.5	15, 12, 10	3.8	11.5	11
24.0	12, 10	3.3	9.9	9
27.0	10	2.9	8.7	8

* Minimum heights, in feet.

Table 1. Discone dimensions for various frequencies f_c. (Values of f_c are chosen slightly below the lower end of the nearest amateur band.)

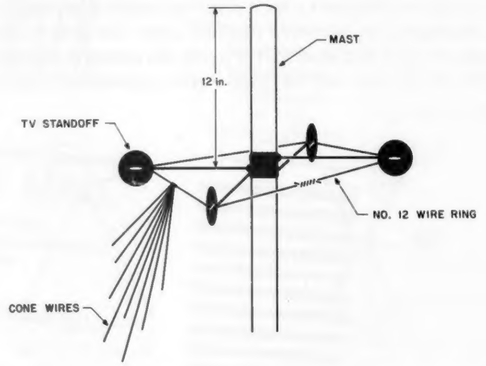

Fig. 4. The ring for the apex of the cone is constructed using no. 12 wire and four clamp-and-screw-type TV standoff insulators. The cone wires are attached in bunches of eight, one bunch to the center of each side of the square.

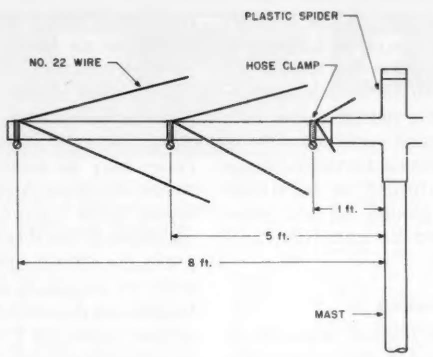

Fig. 5. Radial leg of square disk. Three concentric square rings of no. 22 wire join the radial tubing sections. The disk is mounted at the top of the mast using a plastic quad spider. The mast is wrapped with electrical tape to ensure a tight fit for the spider and also to insulate the disk radials from the mast.

would form a 45-degree angle at the center support point.

The cone apex is constructed as shown in Fig. 4. Four clamp-and-screw-type Radio Shack TV standoff insulators are mounted about one foot below the top of the mast. A length of no. 12 uninsulated solid copper wire should be run through the standoff holes and soldered at the ends to form a square. Caution must be exercised to make sure the ring does not short to the metal parts of the standoffs (and thus to the vertical mast).

To complete the cone, cut 32 lengths of no. 22 wire, each 24 feet long. Solder them in bunches of eight to the center of each side of the apex square. This prevents them from becoming hopelessly snarled when the mast is put up. Have someone hold the top section of the mast upright at its eventual location and fan the cone wires out along the ground in a uniform radial arrangement.

The "disk" is made from four eight-foot sections of one-inch O.D. aluminum tubing, a quad spider, twelve hose clamps, and more no. 22 wire. Insert the four sections of tubing into the spreader holes of the quad spider so that they form an X. In Fig. 5 we see how the wires are attached to the four radial sections of tubing to form the square disk. The wires should be pinched into a small U shape at each point where they are clamped to the tubing. Three concentric wire squares will result. The wires should be straight but not under strain since they will contract in cold weather. Mount the square disk at the top of the support mast, using the spider. Wrap the mast with tape to get a tight fit.

Parts List

Aluminum tubing, 7/8″ O.D., 8′ long	1
Aluminum tubing, 1″ O.D., 8′ long	6
Electrical tape, large roll	1
Ground stake, 2′ long, minimum	9
Hose clamp, 1-1/4″	15
Insulator, porcelain or glass, 4"	8
Spider hub, plastic*	1
Standoff, TV type, clamp-and-screw	4
Wire, uninsulated no. 22, 1000 ft. roll**	1
Wire, uninsulated no. 12, 5-ft. length	1

*Propagation Products, 1855 Cassat Avenue, Jacksonville FL 32210

**Mouser Electronics, 11433 Woodside Avenue, Lakeside CA 92040

Putting It Up

Attach the center conductor of the coaxial feedline (RG-58/U, RG-8/U, or equivalent) to the center of the disk, using a hose clamp at the innermost exposed metal point of one of the radial tubing sections. Attach the outer conductor to the apex of the cone.

Have someone hold the top section of mast, complete with cone wires and disk attached, at the point where the mast is to be erected. Attach two of the cone wires from each bunch to adjacent radial stacks, using an insulator and four extra feet of wire. Raise the mast to its full height while keeping it vertical (a stepladder is almost a necessity to do this!). Tape the coaxial feedline to the mast as it is raised. Once the mast is fully extended, tighten the eight cone wires so that the mast is vertical and is effectively guyed by the wires—but don't pull them excessively tight.

Construct a ring of wire by connecting the eight cone wires together immediately above the insulators. This octagonal ring will be two or three feet above the ground. Then attach the remaining radial wires to the ring in uniform fashion all around. As with the other wires, do not pull them too taut. Each bunch of eight radial wires should run to two adjacent sides of the octagonal cone ring.

The feedline should be decoupled from the antenna at the point where the cable crosses under the cone ring. Otherwise there may be antenna currents on the feedline, with consequent problems. Wind the cable into a tight coil about five or six inches in diameter with 10 to 15 turns. This will choke off unwanted currents on the outside of the coaxial cable while leaving its performance as a feedline unaffected.

Testing

Once the discone is complete, you are ready to test it for swr. Results of testing at W1GV/4 are illustrated by the points in Fig. 1 at 14, 21, and 28 MHz. The swr is expected to begin rising at about 12 MHz. In theory, it should be about 3.5 at 10 MHz.

If the swr is a bit higher or lower than the values shown in Fig. 1, it is probably because of the ground conductivity (which can range from rotten to excellent) and also perhaps because of objects such as trees and electrical wires in the near field of the antenna. In some cases, sharp increases in swr may appear mysteriously at certain frequencies well above f_c. These cases are usually attributable to resonances in nearby objects such as other antenna towers and masts. Keep the discone as far away as possible from other antenna structures.

Since the discone is a vertically-polarized antenna and has a broadband response, it may pick up more man-made noise than resonant (narrowband) or horizontal antennas. A transmatch at the station end of the feedline will give the discone some selectivity, which should help reduce this noise if it is a problem. The transmatch also will reduce harmonic radiation. Hopefully, your transmitter has enough harmonic attenuation already, but the discone offers none at all.

If the swr is not reasonably low and flat (2 or less above f_{min}) and there are no known resonant structures nearby, check to be certain there are no open or short circuits in the system. If the cone apex ring should happen to touch the metal part of one of the TV standoffs,

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the swr will change dramatically. The radial tubing sections of the disk should not short to the vertical mast inside the plastic spider hub. The cone wires should not come in contact with foliage and should be insulated from ground. All wire joints should be carefully soldered.

Conclusion

The discone antenna described in this article was built and tested at W1GV/4 in the summer of 1981, at which time I had the good fortune to be able to use nearly an acre of real estate. Results were as expected. The antenna performed very well for DX on 20, 15, and 10 meters. This is undoubtedly because of the low angle of radiation and the fact that the feedpoint is well elevated above the level of most nearby obstructions, especially houses (which are almost all single-level structures in Florida!). The discone should be a great convenience for multiband operators once we have access to six bands above 10 MHz.

Of course, there is nothing special about f_c = 10 MHz. Larger or smaller discones may be constructed to suit individual desires and needs. Table 1 gives the dimensions of the disk radius, r, and the slant height, h, as well as suggested mast heights for discones having various values of f_c. A discone for 80 through 10 meters is not out of the question if you have a 65-foot tower and a strong pair of legs! The disk, while quite large, could be supported with nylon rope trusses. A lot of wire would be needed for the cones! For serious low-band DXers, though, such a system could be more than worth the effort. ■

References

Bill Orr, *Radio Handbook* (nineteenth edition), Howard W. Sams & Co., Inc., 1972.

Reference Data for Radio Engineers (sixth edition), Howard W. Sams & Co., Inc., 1975.

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Of course, all these rules are "needed" to keep unsightly structures from appearing—structures that could be considered degrading to the uninitiated, thereby reducing property values. Naturally these rules were written with you in mind. That is you, the resident, to protect you. I sometimes wonder if these rules were not written by a landed gent who, having it all, wanted to be sure that all who did not have it, could not, and never would.

Well, just to make sure old Scrooge fails again, here are a couple of antenna designs for the ham who operates 2 meters either fixed or portable.

Fixed Antenna

The first antenna is just a plain 1/2-wave vertical. It's made from the foil stripping that is used for window burglar alarms. This material, which is glued to window glass, is available from Radio Shack. While you're there getting the foil, pick up a two-pole terminal block. The block is used with the window stripping and provides the connection point for your feedline.

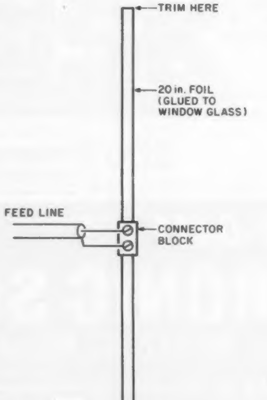

Fig. 1. Half-wave two-meter foil antenna.

The feedline can be RG-58 for power levels over a few Watts, down to RG-174, where a short feedline is needed that will be connected directly to a handheld. If using the RG-174, the run should not exceed 10 feet.

The elements are 20 inches to begin with, and must be trimmed for low swr (see Fig. 1).

Place a good VHF swr bridge in the transmission line at the transmitter. Key the transmitter in the middle of the band, say about 146.000, and read the swr. It should be more than 3:1. Then trim 1/8 inch from both foils (from the ends that are not connected to the terminal block). Now key the transmitter again; the reading should have gone down. Repeat this process until the reading is below 1.7:1.

When 1.7:1 is reached, key the transmitter at 144.000 and note the swr. If the swr is above 2:1 at the low end, trim another 1/8 inch from both foils and recheck the swr. The object is to have an swr below 2:1 over the entire band.

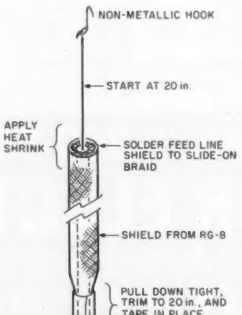
NON-METALLIC HOOK
START AT 20 in.
APPLY HEAT SHRINK
SOLDER FEED LINE SHIELD TO SLIDE-ON BRAID
SHIELD FROM RG-8
PULL DOWN TIGHT, TRIM TO 20 in., AND TAPE IN PLACE
FEED LINE

Fig. 2. Half-wave two-meter flexible antenna.

Portable Antenna

For portable use, this version is built from coaxial cable and can be rolled up and put in your jacket pocket. The antenna, often referred to as a "hypodermic antenna," when in solid form for use on the lower bands such as 10 or 15 meters, is properly called a coaxial vertical antenna. The primary purpose of the antenna is to give the traveling ham a good radiator for use with his hand-held.

The antenna and feedline are one piece of RG-58 and should be 8 to 10 feet in length. Install a BNC connector at one end of the feedline (or whatever connector your HT uses).

Now carefully remove the outer sheath and braid from the last 20 inches of the remaining end, now called the radiator. The sheath and braid will be discarded. Cut 24 inches of RG-8 and carefully remove the sheath and braid. Slide the braid over the end of the radiator and solder as noted in Fig. 2. Discard the sheath.

Now stretch the braid out as much as possible and trim it to 20 inches in length. Tape it in place. Attach a nonmetallic hook to the top end of the radiator and hang the antenna in a location where it is free of obstacles for at least 24 inches. It should be vertical, or nearly so. A good place might be from a ceiling light.

Place a good swr bridge in the transmission line and key the transmitter for 146.000. The swr will be over 3:1. At this point, trim 1/8 inch from the radiator and repeat the test process. When the swr drops below 1.7:1, you have completed the testing. If you cannot get the swr down to 1.7:1, trim 1/4 inch from the bottom end of the RG-8 braid and recheck the swr.

After the trimming is completed, apply heat shrink over the solder point (center of the radiator). This will look neat and will protect the connection.

This antenna works particularly well when hung from the curtains in a motel room or from a branch of a tree. The antenna can be rolled up and tucked away when not in use.

I have not delved into heaps of radio theory since these are supposed to be easy projects. Just follow the instructions and you'll have working antennas that will perform like bandits. ■

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The Snake with LED Eyes

A tall tale from the Antlers—where the decoration is strange and the stories are even stranger.

It was a quiet Friday evening more than a month from the St. Patrick's Day craziness, and I was sitting at my favorite table under the canoe at the Antlers, listening to some VE3s chattering on the local repeater and savoring an oversized can of Australian beer. Bill Tomlinson, a local newspaperman who also is a ham, came in with a couple of cronies from the Coast Guard base, spotted the empty seats at my table, and sat down. He motioned for two more of the jumbo 807s, and while the two other fellows were ordering giant Paul Bunyan hamburgers, I quizzed him on how things were down at the office, how was the new rig—all the usual trivia. He was giving body language signals that fairly shouted that he had another outrageous adventure to relate, but he was being cagey, waiting for someone to coax it out of him.

Rolly Macksohn, president of the local repeater group on the Michigan side of the border, came in a few minutes later with three or four kids from a night class in computers that he was teaching. They pulled the next table out from its usual place under the stuffed moose's rump on the ceiling and pushed it up to ours, dragging along chairs as needed. The waitresses brought food and a couple of large pitchers of domestic beer. Tomlinson took a deep drink, cleared his throat noisily, and looked around. One of the newcomers was holding a Tooth lager beer can to his left ear, listening intently. I thought at first the kid was listening to the bubbles fizzing, but then I saw a VHF rubber duckie coming out of a BNC connector in the center of the can lid, and I knew this was the right sort of audience for one of Bill's yarns. Sure enough, he took another big pull on that oversized 807 and started right in.

CHRIS CLOUTIER-81

I knew this was the right sort of audience for one of Bill's yarns.

"New stuff at the paper? Well, you might say that. About three or four weeks back, we were having one of those really terrible, no-news days, you know, when there's nothing on the photo wire but pictures of cute children making snowmen, and a giant icicle at some college dorm in Houghton is front-page copy. Tim Gallock was walking around with his stomach out and his cheeks puffed, doing Lou Grant imitations. One of those days. Mary Chen KH6DDD comes into the office and tells me we have a special assignment. Now this is a little scary, because while I like working with Mary and

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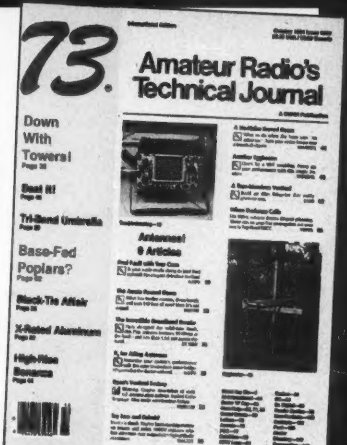
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she's utterly gorgeous, she also has this NHL-forward boyfriend who is insanely jealous and has more stitches in his face from fights than my word processor has failure modes.

"Anyway, she really liked a piece I did a few months back on those want ads claiming you can make hundreds of dollars an hour stuffing envelopes for some company. It was a really funny exposé. The readers loved it, and I'm still getting junk mail like you wouldn't believe. We decided to go after the want ads again, this time the ones in the back of the mystery and science fiction magazines advertising 'Beautiful Puerto Rican girls desperate for American Boyfriends,' and the ones selling antigravity, 200-mpg carburetor secrets, and UFO photos—stuff like that.

"We divided it up, Mary taking the mail-order girl racket first and me going after the crackpot inventions, then we'd switch off. I had a blast at first, sending off the newspaper's stamps and petty cash to all those ads. A lot were thinly-disguised pyramid or chain letter gimmicks, or routine automotive mousemilk that probably wouldn't actually wreck your car's engine, but wouldn't give you any miracle mileage, either. Then I ran into an ad that was repeated in all the magazines printed by a big publishing house; it must have been sold as a package deal. The ad said:

Tired of Rotten QRM?
Outlaw Kerchunkers
Running You Ragged?
Now There's Relief at Hand.
Try Our Computerized ID
And Call-Finder Kit
And Give Those Rf Turkeys
The Ol' Wouff-Hong!
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If Not Delighted!

"This one really had me wondering. This was not, I repeat not, an amateur-radio magazine, but the ad was plainly aimed at us hams. Also, forty bucks was more than the usual petty amount the paper had authorized. I had to argue for a few minutes with Fenton, the guy at the city accounts desk, but he finally agreed to go along with it as long as we paid by check and kept a careful record. I was afraid that the ad would turn out to be just misleading, not downright crooked, and that I'd get some hastily-put-together bag of junk ICs that might actually act as some kind of direction finder or callbook file; the ad was, after all, a little confusing.

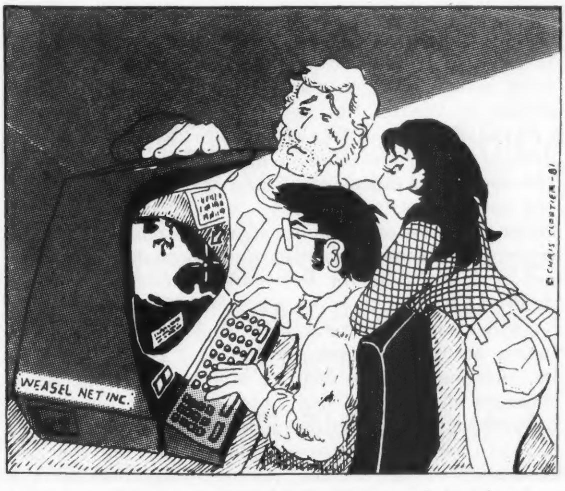
"Three days after I dropped the check in the mail, the UPS van delivered three big cardboard cartons, each of them maybe the size of a DX-100. Mary and I cleared out an old meeting room over in the printing plant and laid the stuff all out on a big conference table. Half the bulk of the packages was those plastic foam peanuts they use for packing, but there was also a manual the size of a Grand Rapids phone book and one heckuva lot of parts.

"There was a motherboard, a fancy aluminum card cage, a power supply that could have run a sizeable linear, and a dozen circuit boards, all crammed with expensive-looking parts. I began to smell a rat the size of Sumatra. There must have been a couple of thousand dollars worth of parts there, fancy CMOS computer ICs, hundreds of gold sockets and precision trimmers, and this one monster chip: a slab of what looked like solid sapphire the size of a playing card and a quarter-inch thick. Any of you ever see a 1024-pin DIP socket before?"

There were several laughs and shakes of the head around the table. Several jumbo baskets of fries were being passed around, and more pitchers of beer. A half-dozen other regulars had come over to the tables from the corner, over by the stuffed boa constrictor with the LED eyes that light up at closing time. The crowd was beginning to get in the way of the waitresses, though they didn't seem to mind. Bill accepted a fresh cannister of Aussie brew from somebody, refilled his glass, and continued.

"It took us three days, working almost full time, to assemble the blasted thing. The manual was pretty explicit as to how things plugged together, but I still was having trouble figuring out exactly what it was supposed to do. Also, I was worrying about spending so much time in a secluded room with such an attractive YL. I finally invited the boyfriend with all the scars and her both out to dinner and over to the plant afterwards. He turned out to be a pretty nice guy, a VE2 from someplace near Montreal, and a computer freak to boot. He was fascinated by the gizmo and helped me haul all the hardware over to my shack for the first on-the-air test.

"The next morning was a Saturday, and after a pot of coffee and lots of blueberry pancakes, we all met at the shack: Mary and her beau, two guys from the newspaper, and myself. First we ran coax to two antennas. The instructions required two vertical antennas at least a quarter-wavelength long on the lowest frequency to be used. Another plug ran to one of those flat membrane keyboards like they use in the cheaper home computers, and another cable ran to the UHF input jack on a TV. I hooked it up to a big color console that I had been fixing for a neighbor.



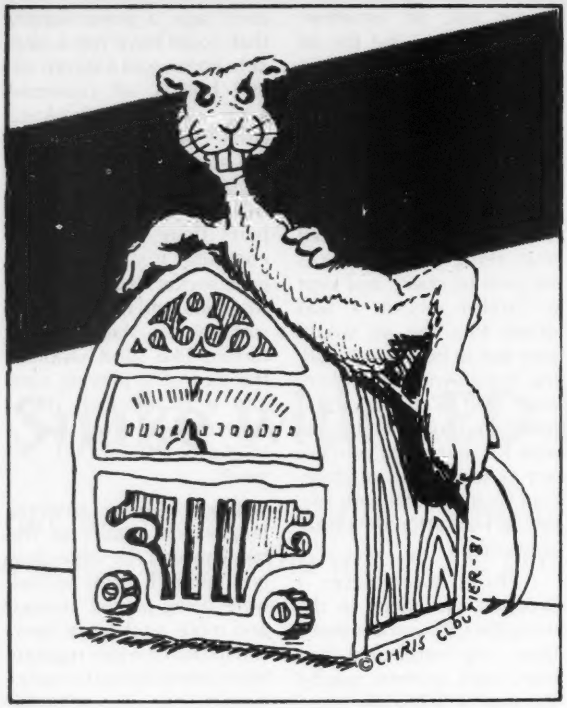
"...we all met at the shack: Mary and her beau... and myself."

"When we turned on the power, a whole regular questionnaire appeared on the TV screen, with blanks to be filled in by typing on the keyboard. I was beginning to worry. Obviously, there was a lot of expensive computer stuff here, and it was going to really hit the fan when those people in Arizona realized that they'd sent it to me by mistake for forty bucks.

"The questions on the screen were really detailed, but they made sense, sort of. I typed in the model number of my rig and plugged the cables provided into the antenna, vfo, and headphone jacks. Next, the screen demanded the exact latitude and longitude of the antenna array, the spacing, and the exact length of the coax to each in millimeters. Well, it so happens, there's a surveyor's bench mark in the corner of my lot, so that wasn't hard, and Steve, the VE2, volunteered to go out in the freezing cold with a measuring tape. While he was getting the measurements, I warmed up the rig and then tuned to zero beat on WWV, just as the instructions said. Steve soon came back in with the measurements required, and we had some more hot coffee while Mary typed the numbers in.

"Next came the phone connection. I was a little uneasy about bringing Ma Bell into the picture, but I did as the instructions said. I plugged the little modular jack into the wall, piggyback with the regular phone cord. Then I dialed the toll-free 800 number in the manual. There was a series of clunks and beeps, and then another dial tone. I dialed the second number, this time using the touchtone™ pad on the flat keyboard. There were more beeps and clicks, a single ring, and then a strange, robot voice that said, 'Good morning. Password, please.'

"I typed in the characters, 'WSLNET.COM' on the keys, and there was a final click. The color screen sprang to life, the questionnaire replaced by something out of the control panel of a movie spaceship. I tuned the knob on the rig slightly and realized that what I was seeing was an incredibly detailed panoramic display of the whole HF spectrum. The bands were displayed in different colors, and the exact center frequency of the receiver passband was displayed in video numbers next to a vertical cursor that moved as I twiddled the dial. Not only that, but there was a compass heading in the upper left corner that changed as I rotated a knob. I tuned to the twenty-meter phone band, and sure enough, the signals on the display increased and decreased in strength, just like swinging a beam. The box was electrically rotating the lobe of the antennas without physically moving any parts.



". . . and there's this little cartoon picture of a weasel sitting on an antique radio."

"Certainly this gadget was worth more than a mere forty bucks. It was also one heckuva direction finder, and I resolved to write a nice letter to the people at Weasel Net to apologize for having thought them charlatans. The newspaper exposé was out, but perhaps I could sell an article to one of the ham or computer magazines and get in a free plug for so deserving a company.

"As we sat in the shack, tuning across the band, I ran into one of those very situations that the ad had mentioned. I had been listening to one of those maritime mobile nets on the high end of twenty, watching the various signals check in from different parts of the DX world. Steve showed me the controls that expanded the scale of the panoramic display so that ten kHz or so was spread over the whole screen, and you could see in detail the speech envelope of each station. Suddenly some clown was right on top of them, calling 'CQ contest, CQ contest,' over and over again. It was pretty obviously deliberate jamming, as the lid never once gave his callsign, and once or twice wisecracked back at the net control station who asked him to QSY.

"I could tell that the signal was coming from the south, probably skip from southern Georgia or Florida, and I had a fairly good bearing on the compass display. I asked Mary how I was supposed to get a real fix on a signal. She showed me how to use a light pen to tag the particular waveform of the QRMing signal and touched a button. The signal turned a bright orange on the screen and stayed that color even on successive transmissions. Next, I typed in the command that Steve had found in the manual:

'A:WSLNET.PAN>
WSLNET.RDF(V)'

"The panadapter display disappeared, and the screen was filled with hexadecimal numbers. The box plugged into the still-open phone line beeped and kerchunked, and there was a long blast of what sounded like high-speed Teletype®; a lot of information was coming in from somewhere. The numbers on the screen were replaced with a beautiful, four-color map of a residential suburb and a latitude and longitude display right to the second in the upper right-hand corner. This apparently was the source of the QRM. The US Geodetic Survey numbers in a corner of the screen allowed us to identify a suburb of St. Petersburg, Florida, and a fuzzy red circle, a block or so in diameter, showed the source of the intruding rf.

"Steve, who had been leafing quickly through the manual all this time, typed out the characters:

'WSLID.DIR'

The picture shifted to what looked like one of those satellite or high-altitude U2 photos, blown up until it's just a trifle fuzzy. You could just make out the corner house in the block that had been circled on the map. After a few seconds, a new version of the picture was written slowly on the screen, one line at a time like a slow-scan TV frame or one of those NASA photos of Saturn. After a few passes, the picture was greatly improved, though still at the same scale. Now you could clearly make out the details of the large, ranch-style house, an Oldsmobile Toronado in the driveway, and a large triband beam on a tower in

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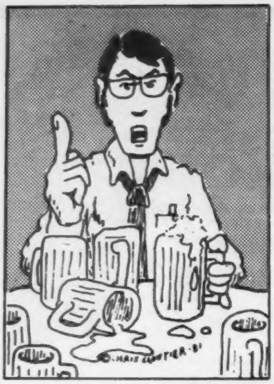
the backyard. The right-hand margin of the picture had a printed listing, address and phone number, and a facsimile of an amateur-radio license made out to one Wilbur Glemp, 1524 Brightwaters Boulevard NE, St. Petersburg. This was apparently the location of the lid who was still calling 'CQ contest, CQ contest, anybody out there for another contest?' over and over as we listened.

"Steve showed Mary another listing in the manual, and she typed it in. The picture, which had been in slightly fuzzy color, now switched to black and white, but with greatly improved detail. Several more passes with the computer enhancer didn't do much to improve the resolution. The telephone line beeped and warbled some more; I wondered just where the heck all this information was coming from. A weather satellite perhaps? Old cartographic photos? It was hard to say.

"I had one of those big magnifiers on a pantograph arm on the end of the workbench. I turned off the little fluorescent light and positioned the lens over the TV screen. Now I could just barely make out a man seated at a table in the patio behind the house in Florida. There was a ham station laid out on the table, three boxes, and what looked like a linear on a little cart. You couldn't quite tell if the rig was a Collins S-line or some other kind of radio, partly because of the fuzziness of the scan lines on the color TV and partly because of a folded beach umbrella on a stand over the table.

"You could see the man at the table move, but it was a trifle jerky, somewhere between true slow-scan and early Project Mercury astronaut films in speed. This was great, but how could I tell that it wasn't a hoax and that this fellow sitting there in a loud shirt with a microphone in one hand and a can of beer in the other wasn't just a clever cartoon dreamed up as a gag by the Weasel Net folks out in Arizona? The ham license looked genuine, but I was surprised to see that it was one of the new two-letter prestige calls. The rest of the picture didn't quite jibe, either. The house was obviously in a nice neighborhood, right across the street from Tampa Bay, with yachts, expensive cars, and lovely Spanish-style homes all around. Why would somebody who had it made be hassling a regular traffic net that was eminently useful and constructive?



"...some of you think I made the whole thing up..."

"I decided to try an experiment. I picked up the phone and dialed the Florida number on the screen. As the number rang, the jamming voice, which had been chanting 'Rotten contests, rotten contests, rotten, rotten, same old contests...' broke off, said, 'QRX one, fellas,' and the jerky figure on the screen reached for the phone and answered it. 'Hello?'

" 'Mr. Glemp?' I said.

" 'Yes?'

" 'You probably don't know me, but my name is Tomlinson, and I work for one of those government agencies famous for its initials. I wish you'd cut it out, Mr. Glemp. Those fellows are just doing their public-service duty, and breaking the law could get you into a lot of trouble. I'm a ham, too, and I've got better things to do with my time than sit in a stuffy federal courtroom in Pinellas County. Knock it off, and maybe we'll work you on the air sometime. 73.' And I hung up the phone.

"The little figure on the screen hung up too, turned off the rig, and started staring around in all directions, even up at the satellite or camera or whatever was the source of the video. Then he started frantically disassembling the station, carting all the boxes one by one into his garage. It was comical and pathetic at the same time, and I was reminded of the famous comedy routine by Bob Newhart or Bill Cosby, or whoever it was, about the little brat who answers the phone, and the man calling says he's God and warns the kid not to hang up.

"I spent the rest of the day playing with the rig, and you'd be surprised how many people do their hamming outdoors where they can be seen. I listened in on a famous ham on a tiny South Pacific island while he tinkered with his new solar-power plant, Boy Scouts gathered around a pup tent portable on a mountainside, even a lovely YL who checked into a CW traffic net while sunbathing in privacy (or so she thought!) beside her swimming pool in California.

"There weren't really that many lids breaking the rules; most hams really are pretty well-behaved, and I just didn't have the stomach to turn the thing on eleven meters. A half-hour trying to copy the code practice from W1AW was bad enough.

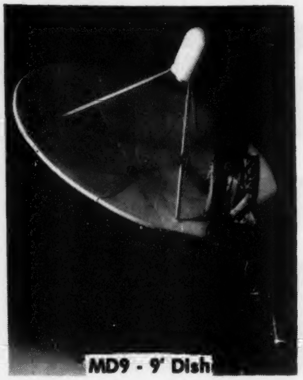
"The following Monday, I had the guys in the shop print up some official-looking pink-paper forms, all covered with eagles and lightning bolts and important-looking seals, and I had a friend who lives in Langley, Virginia, mail out a batch or two to deserving idiots as a friendly warning, and the QRM died down amazingly for a while..."

"How about the kerchunkers?" the kid with the rig in the beer can interrupted Bill. "Was the thing any good on VHF?"

"It surely was, but, of course, there were limitations. Listening to the output channel of a repeater didn't do any good; you had to be able to hear the signal direct, and the setup wasn't exactly very portable. I suppose we could have built it into a van and driven around with a mobile telephone link and a whole lot of surveying gear, but it just didn't seem all that practical. Then, too, your average repeater kerchunker gives it only an occasional hit for a second or two, which makes him pretty hard to pin down. I suppose in the case of frequent, extensive jamming by a real commode-brain, or in the case of clandestine remote transmitters deliberately planted as a challenge to the repeater sponsor, the thing would have been worth its weight in IRCs. We don't have any of that sort of crap around here, thank God. It's not like those stories you hear about California."

"Amen...You said it, man...Sure 'nuff..." There was murmured assent from around the table.

"Hey, Bill," Rolly broke the sudden silence that had fallen, accompanied by several members of the group signaling for more beer and fries. "You still have that marvelous machine? I'm certain most of the fellas here would love to get their hands on that sort of fancy hardware and do their little bit to help promote law and order on the airwaves." There was



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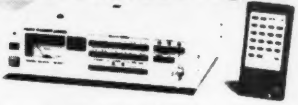

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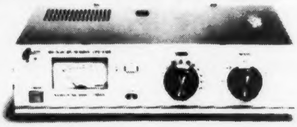

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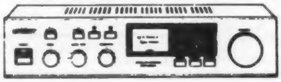

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CH.20 UHF ANTS-INDOOR POLE MT,OUTDOOR MT
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more muttering and widespread grins; people could see it coming.

"Ahhh, Rolly, would that I did!" You could see the wheels grinding as Bill Tomlinson thought up his excuse for not being able to produce the marvelous machine. "I kept that li'l rascal for about three weeks, and by the end of that period, there was a noticeable nadir in stupidity on the low bands, anyway. It's still down a bit, to this day. Then I began to get a little paranoid. I kept wondering who was behind these Weasel Net fellas, and why anybody would lay out the money and engineering talent to set up all that equipment, all over the country. There had to be hundreds, maybe thousands of those machines, and satellite links and heaven knows what else. Who stood to profit? The government, the CIA, who? Maybe it was a sneaky way for the FCC or somebody to get a lot of volunteers to help police the spectrum, maybe the military, or even some foreign power was involved. An array of hundreds of HF receivers all spread across the whole country and all tied together with computers and phone lines is a pretty powerful piece of technology. Maybe I was unjustly paranoid, but a number of little things began to really bother me.

"First off, that phone line was open all the time, both ways. My regular phone still worked okay, but every so often, I'd pick up the handset late at night, say, and there'd be strange clicks and funny teletype noises. I never got any extra phone bills, but still it bugged me. And then I'd go into the shack and find the doggone rig on, when I swore that I'd turned it off the night before, or I'd leave the shack for a while to get a cup of coffee or an 807, and I'd come back and find the dial on the rig set on a different frequency. One time I was working this G3 buddy on ten-meter phone, early in the morning, my time. That ding-blasted Russian woodpecker comes on with its doggone pocketa-pocketa noise, and I thinks to myself, I'm gonna see where that so-and-so really comes from, whether it's Russia, or Iran, or wherever. So I went through that whole routine, like I did that time with that Glemp turkey in Florida. Only, when I typed that 'WSLNET.RDF' command into the machine, the screen turns bright red, and a printed notice appears that says, 'Sorry, but we are not allowed to divulge that QTH at this time. Thanks for the good effort, and hang in there, OM!' and there's this little cartoon picture of a weasel sitting on an antique radio.

"Finally, I decided that enough was enough. I took the rig all apart, clear down to its component boards and modules, making careful photographs of everything as I went. Then I ran that whole manual, every last page of it, through a Xerox machine at work, two copies of everything, and gave one set to a friend to put in a safe place. Then I boxed the whole thing up, went down to the post office, and sent it back to Arizona, insured and return receipt requested. The very next morning, I received my original check back; it had never even been cashed! I found enough other stuff in the screwy want ads to do a fairly humorous piece for the paper. Mary did a separate, serious article about the mail-order Oriental and Latin American bride agencies; it turns out that just like massage parlors, a good many of them are perfectly legit, though they tend to advertise in a slightly sleazy, suggestive tone to keep the cards and letters coming in. Mary and Steve are going to be married right after the Stanley Cup playoffs, and they are already planning to generate lots of harmonics. Those old jokes about non-Caucasian hockey players may not be very funny in another twenty years or so. Ooops, there goes last call!"

There was a cacophony of bells, gongs, sirens, steam whistles, and gun shots as the clock over the bar lit up for last call. The eyes on the snake lit up, and the stuffed grizzly bear came out of the women's washroom on its roller skates and rolled up to the bar making tinny growling noises. The bartender patted the bear and threw a couple of switches behind the cash register. The bear rolled around the room, growling more, and rolled back into the women's john.

Bill got up to go. He took a handful of 5" × 7" photographs from his inside coat pocket and tossed them on the table next to a pyramid of Australian beer cans.

"I realize some of you probably think I made the whole thing up, just so I could mooch a couple of free drinks while I told you a bunch of lies, only of course you're too polite to say it. Here you go, look 'em over. I've got plenty more prints. Good night!" and he walked out the door, ducking his head to miss the stuffed coyotes and the airplane propellors hanging from the ceiling. Two guys I'd never seen before got up from a corner table under an old Irish flag and followed him out.

There really were some beautiful photos of fancy-looking electronic gear, but somebody set them down in a puddle of spilled Foster's on the table, and they suddenly fizzed, smoked, and turned black. I'm going to ask Bill for a couple of those passwords and phone numbers, next time I see him. ■

UNINTERRUPTED FREQUENCY COVERAGE 100KHz~1.4GHz with RF CONVERTERS for SX-400 SERIES

SCANNING MONITOR RECEIVER

FIRE
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BUG DETECTOR

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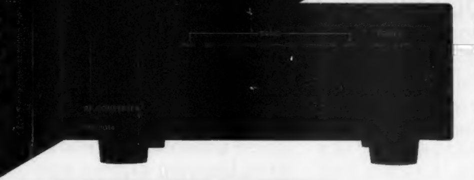
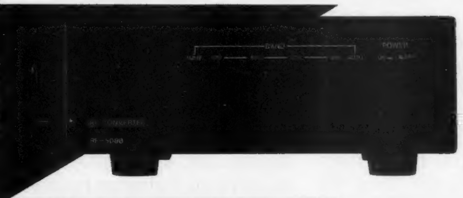


RF-8014 DOWN CONVERTER

800MHz~1.4GHz RF converter for SX-400

●Bands:•MAIN (to cover 26~520MHz with SX-400)•800MHz~1.0GHz•1.0GHz~1.2GHz •1.2GHz~1.4GHz•AUTO (Automatic control of RF-8014 with an external computer, etc.) ●Frequencies shown in SX-400 display: 500MHz lower between 800MHz~1.0GHz, 700MHz lower between 1~1.2GHz, 900MHz lower between 1.2~1.4GHz. ●Individual Band Switches and LED Indicaters. ●Current Drain: 250mA (approx.) ●Accessories: 1 BNC/M-adapter, 1 Cable with BNC terminals ●Dimensions: W.148×H.51×D.225(mm)



RF-5080 DOWN CONVERTER

500~800MHz RF converter for SX-400

●Bands:•MAIN (to cover 26-520MHz with SX-400)•500~600MHz•600~700MHz•700~800MHz •AUTO (Automatic control of RF-5080 with an external computer, etc.) ●Frequencies shown in SX-400 display: 300MHz lower between 500~600MHz, 400MHz lower between 600~700MHz, 500MHz lower between 700~800MHz. ●Individual Band Switches and LED Indicaters. ●Current Drain: 250mA (approx.) ●Accessories: 1 BNC/M-adapter, 1 Cable with BNC terminals, ●Dimensions: W.148×H.51×D.225(mm)

RF-1030 UP CONVERTER

100KHz~30MHz RF converter for SX-400

●Bands: (1) 100KHz~1MHz, (2) 1~2MHz, (3) 2~4MHz, (4) 4~8MHz, (5) 8~17MHz, (6) 17~30MHz•AUTO (Automatic conrol of 6 bands of RF-1030 with an external computer, etc.) ●Frequencies shown in SX-400 display: 50MHz higher on all bands than the frequencies received. ●Individual Mode Switches and LED Indicaters: AM, USB, LSB, CW, AUTO•CW filter (optional) required for CW reception•AUTO—Automatic Control of modes of RF-1030 with an external computer, etc. ●Band Switch and LED Band Indicaters, Squelch Control, RF Att., AF Gain Control, Delta Tuning, IF ON/OFF Switch, NB (Noise Blanker) Switch. ●Current Drain: 1A (approx.) *Power Supply Unit P-1A (optional) required for RF-1030. ●Accessories: 1 BNC-M-adapter, 2 Cable with BNC terminals ●Dimensions: W.300×H.90×D.233(mm)

ACB-300 ANTENNA CONTROL BOX

Manual and Automatic antenna control system for SX-400 series RF converters

●Individual Band Switches and LED Indicaters: 1030, 5080, 8014, 1.4GHz UP (for reception of 1.4GHz above) AUTO (Automatic control of antennas for RF-1030, RF-5080, RF-8014 and for MAIN scanner) ●Current Drain: 50mA (approx.) ●Accessories: 1 Cable with BNC terminals ●Dimensions: W.148×H.51×D.225(mm)

SX-400

26~520MHz General Coverage Scanner

●Wider Coverage (100KHz~1.4GHz or above) with RF converters (optional). ●Computer controlled memory channel expansion (unlimited), High-Speed reprogramming, Record of Frequencies and Time, and all functions remote controllable with RC-4000 Interface (optional). ●20 memory channels, Momentary recall of any memory channel. ●Continuous normal and limit search without interruptions by birdies. ●Stop Mode Switch for scan or search of modulated signals. ●Quick search of the most important frequency with Priority. ●Selective FM Narrow/Wide Switch for FM/TV listening. ●Variable Delay Control (0~4 Sec.) ●Current Drain: 1A (approx.) ●Dimensions: W.300×H.90×D.233(mm)

RC-4000 DATA INTERFACE Control of SX-400 series Scanner and RF Converters through Computer.

●Direct system for NEC 8801A computer. ●High-Speed Reprogramming of 20 channels. ●Scan of unlimited channels stored in computer. ●Record of Frequencies and Time of signals received. ●Automatic Control of Bands and Modes of RF converters and ACB-300.

P-1A REGULATED POWER SUPPLY UNIT ●1A ●AC 120V (220V, 240V, 100V available) to DC 13.8V ●Dimensions: W.90×H.60×D.135(mm)

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Harry D. Hooton W6TYH
1420 Shamrock Lane
Lincoln CA 95648

Up, Up, and Array

W6TYH's hybrid collinear will rocket your signal to new heights!

When an antenna conductor is cut for half-wave resonance at a given frequency, it is called a dipole. When a dipole is operated at a frequency twice that at which it resonates as a dipole, its radiation characteristics change and it becomes a simple, rudimentary, bi-directional beam antenna or array. While the vertical directivity remains the same as that of the dipole, the horizontal directivity can be concentrated into a sharp pattern, as shown in Fig. 1.

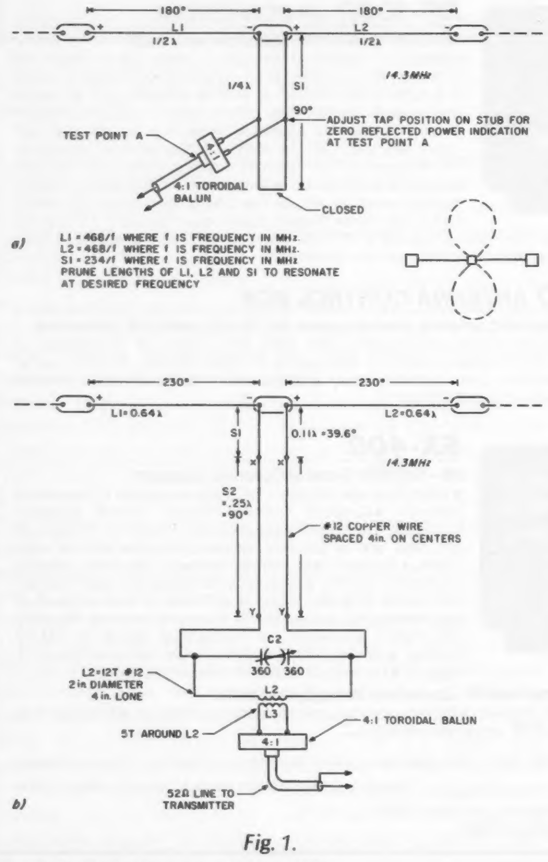
180°
180°
L1
1/2λ
L2
1/2λ
1/4λ
S1
14.3MHz
90°
ADJUST TAP POSITION ON STUB FOR ZERO REFLECTED POWER INDICATION AT TEST POINT A
TEST POINT A
4:1
4:1 TOROIDAL BALUN
CLOSED
a)
L1 = 468/f WHERE f IS FREQUENCY IN MHz.
L2 = 468/f WHERE f IS FREQUENCY IN MHz.
S1 = 234/f WHERE f IS FREQUENCY IN MHz
PRUNE LENGTHS OF L1, L2 AND S1 TO RESONATE AT DESIRED FREQUENCY
230°
230°
L1=0.64λ
L2=0.64λ
S1
0.11λ =39.6°
X
X
14.3MHz
S2 =.25λ =90°
#12 COPPER WIRE SPACED 4in. ON CENTERS
Y
Y
C2
360
360
L2=12T #12 2in DIAMETER 4in. LONE
L2
L3
5T AROUND L2
4:1 TOROIDAL BALUN
4:1
52Ω LINE TO TRANSMITTER
b)

Fig. 1.

In the past, the array shown in Fig. 1(a) was first called a *full-wave, centerfed zepp antenna*. Later, it was dignified by calling it "a pair of half waves in phase," or "collinear" antenna. In its simple form, it consists of a pair of radiators each 180 degrees long, as shown, and fed at the center with an open wire, usually some definite number of quarter wavelengths long. The simple double-zepp antenna has a a bi-directional gain over a half-wave dipole of about 2.8 dB.

If each radiator element length is increased to 230 degrees, the radiation pattern becomes sharper in the horizontal plane and the gain in each direction increases slightly to about 3.0 dB over that of a half-wave dipole.

The array with the two 230-degree elements is usually referred to as an extended double-zepp antenna and will be found in most antenna handbooks. These antennas generally are used on the 75- and 40-meter bands but will work well on the 20- and 15-meter bands for distances of up to 2500 miles or so.

An Improved Extended Double Zepp

Today, most hams prefer to use coaxial-cable transmission lines mainly because porcelain spreaders have become almost nonexistent, but also because the long open-wire lines are considered unsightly. The array shown in Fig. 1(b) uses the conventional open-wire tuned-feeder type of transmission line, a quarter wavelength long between points X and Y. The 4:1 balun couples the resonant circuit to the 52-Ohm line. I used this antenna on 14.3 MHz for several years with good results for medium-distance contacts across the USA. However, the feed system was an eyesore, particularly to the XYL, and the system was changed to allow coaxial feed all the way up to the radiators.

As most hams know, a gain difference of 0.2 dB is peanuts and will not be apparent in the strength of a received signal. If the radiator elements are made 180 degrees long instead of 230 degrees, a tuned circuit can be inserted at the center feedpoint and the 52-Ohm coaxial line can be coupled to this circuit through the 4:1 balun as before. It should be understood distinctly that this circuit is *not* a "trap" in the usual sense but a parallel-resonant circuit tuned to the operating frequency. Each radiator section is 180 degrees (half wave) long at the operating frequency. The construction and adjust-

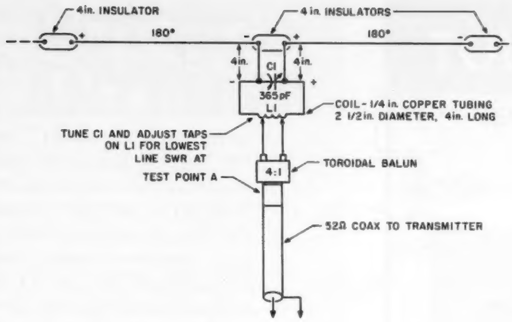
4in. INSULATOR
4 in. INSULATORS
180°
180°
4in.
4in.
CI
365pF
LI
COIL - 1/4 in. COPPER TUBING 2 1/2in. DIAMETER, 4in. LONG
TUNE CI AND ADJUST TAPS ON LI FOR LOWEST LINE SWR AT
TEST POINT A
4:1
TOROIDAL BALUN
52Ω COAX TO TRANSMITTER

Fig. 2. Coupling circuit moved to the center of the antenna.

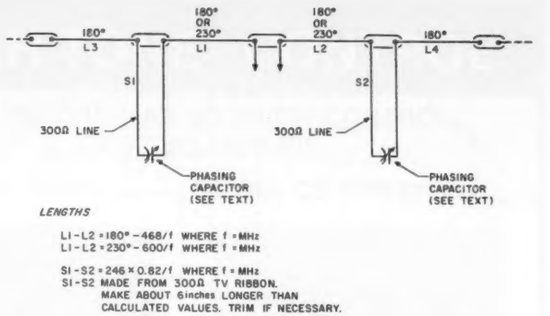
180°
L3
180° OR 230°
L1
180° OR 230°
L2
180°
L4
S1
S2
300Ω LINE
300Ω LINE
PHASING CAPACITOR (SEE TEXT)
PHASING CAPACITOR (SEE TEXT)
LENGTHS
L1-L2 = 180° - 468/f WHERE f = MHz
L1-L2 = 230° - 600/f WHERE f = MHz
S1-S2 = 246 × 0.82/f WHERE f = MHz
S1-S2 MADE FROM 300Ω TV RIBBON.
MAKE ABOUT 6inches LONGER THAN
CALCULATED VALUES. TRIM IF NECESSARY.

Fig. 3. Added phasing stubs. Center elements may be 230° long (extended double zepp) or 180° (two half waves in phase) collinear. See text.

ment of the resonant circuit will be covered in detail later.

Adding Additional 180-Degree Elements

If we add two more elements to the extended double zepp, as shown in Fig. 3, the width of the horizontal radiation pattern will be reduced and the gain in each direction will increase to about 4.5 dB over a half-wave dipole operated under the same conditions of height and power input. In the past, it has been the usual practice to use open-wire line for the quarter-wave phasing stubs. When constructed from No. 12 or No. 14 copper conductors and porcelain spreaders, the stubs are unsightly to most people and tend to whip around in the wind. After a short time the two conductors are not equally spaced from top to bottom, and the system becomes detuned. If the stubs are made of good-quality 300-Ohm line sections, the spacing will remain constant under all conditions and the appendages are not so noticeable.

In the past, it has been the custom to prune the length of the stubs to resonate the system and produce the correct phase relationship between the radiator elements. If the stubs are made equal to 246 × 0.82/f, where f is the operating frequency, with about 6 to 8 inches added to the calculated length, a variable capacitor may be inserted in series with the stub conductors as shown in Fig. 3. Each capacitor can be adjusted for correct system resonance and phase. The capacitors for a 20-meter array are about 360-pF maximum capacitance and were obtained from old tube-type table-model AM radio receivers.

To adjust the capacitors for correct resonance and phase, I used a battery-operated portable shortwave receiver (the GE model 7-2990) for a field-strength meter. The receiver is placed about 200 feet (or more) distant from the "front" or "back" of the array and the array is excited with about 5 to 10 Watts of rf power at the operating frequency. Have someone watch the S-meter indication on the receiver. Make certain that the receiver is tuned for peak meter indication. Simply adjust each phasing capacitor for maximum indication on the receiver S-meter. Carefully remove each capacitor without disturbing its capacitance setting. In the lab, measure or otherwise determine the adjusted capacitance of each capacitor. Select a mica dielectric *fixed* capacitor of the same value as that of the adjusted variable. Insert the fixed capacitor in the stub in the same position as that occupied by the variable. Check the field strength as indicated by the receiver S-meter.

If you wish to resonate and phase the array by adjustments in the 300-Ohm-line stub lengths, make the stubs about 6 to 8 inches longer than the calculated length as described above. Using a grid-dip oscillator tuned to the operating frequency, couple the shorted end of each twinlead stub to the grid-dip oscillator coil. Prune the length of the stub, a half inch at a time, for the greatest dip indication on the gdo. When each stub has been adjusted in this manner, short the two stub conductors together and solder the connection. Tape with plastic electrical tape to keep out moisture.

How to Eliminate Phasing Stubs

The purpose of the phasing stubs is to shift the phase of the rf current and voltage so that each 180-degree radiator section will be in phase with that of the others. In other words, the rf currents in all radiator elements must be flowing in the same direction at any given instant. If you will check your basic theory of resonant circuits, you will find that in a parallel-resonant circuit, *at resonance*, the two rf voltages (or the two rf currents) are 180 degrees out of phase with each other. The rf voltages at the upper end of the stub are also 180 degrees out of phase with each other. Therefore, there is no reason why a parallel-resonant circuit cannot be substituted for the stub and the radiating system will never know the difference.

When I first discussed the idea of using the parallel-resonant circuits instead of the stubs, a couple of antenna experts insisted that the tuned circuits would "trap out" the current to the end radiator elements and that the system would not load. If you have any doubts, adjust the system as described later, feed about 25 Watts of rf power to the system, and then touch a neon lamp to each end of each 180-degree radiator element. The lamp will light up with equal brilliance at all high rf voltage points.

The gain of the array will be maximum when the phase-shift circuits are resonant at the operating frequency. To obtain the highest possible gain, the resonant circuits should be made with a high Q. However, if the tuned-circuit Q is made excessively high, the bandwidth of the system will be reduced to about 100 kHz on the 20-meter band. If the Q is made relatively low, the gain will be reduced somewhat but the array can be operated over the entire 20-meter phone band without deteriorated performance or an excessive rise in the 52-Ohm-line swr.

For a high-Q 20-meter system, the inductor, L1, consists of 3 turns of 1/4-inch copper tubing, 2-1/2 inches in diameter and spaced to a length of about 4 inches.

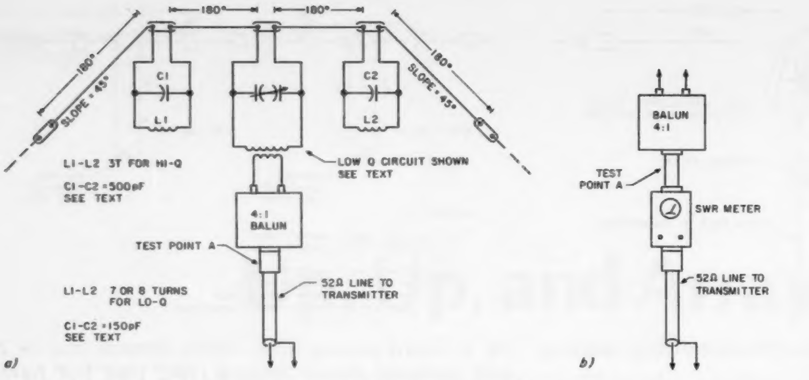
180°
180°
180°
SLOPE = 45°
180°
SLOPE = 45°
C1
L1
C2
L2
L1-L2 3T FOR HI-Q
C1-C2 = 500pF
SEE TEXT
LOW Q CIRCUIT SHOWN
SEE TEXT
4:1
BALUN
TEST POINT A
L1-L2 7 OR 8 TURNS
FOR LO-Q
C1-C2 = 150pF
SEE TEXT
52Ω LINE TO
TRANSMITTER
a)
BALUN
4:1
TEST
POINT A
SWR METER
52Ω LINE TO
TRANSMITTER
b)

Fig. 4.

The capacitor, C1, is a high-voltage ceramic type with a capacitance value of 500 pF. The circuit is resonated by squeezing or spreading the turns of the coil for resonance at the desired operating frequency (14.3 MHz in our case). If constructed in this manner, the circuits may be inserted in the antenna system without placing them in weatherproof enclosures. (At W6TYH, the system does not indicate any detuning even in wet weather.) It will be necessary to readjust the resonant circuits after they are inserted in the system, since the high-Q units are somewhat sensitive to the height of the radiators above ground.

For a low-Q system, make the capacitor values about 150 pF each and each coil about 7 or 8 turns. Spread or squeeze together the turns until resonant at the desired frequency as indicated by a grid-dip oscillator. When adjusting either the parallel-resonant circuits or the stubs, as described above, always monitor the gdo frequency with a calibrated receiver. The gdo frequency will be "pulled" by the coil adjustment. Both tuned circuits must be adjusted and installed in the system and then we are ready to make the feedpoint matching adjustments.

Matching Adjustments

The antenna system will be easier to load if the parallel-resonant circuit at the center is made relatively high Q. If L1 is made from 1/4-inch copper tubing, for a 20-meter antenna, it will consist of 5 turns 2-1/2 inches in diameter, spaced for a length of about 4-1/2 inches. The variable capacitor, C1, is a 150-pF double-spaced type removed from an old war-surplus transmitter. The output connections from the 4:1 balun are tapped on L1, one turn each side of center. The swr meter is inserted in series with the 52-Ohm line, as shown in Fig. 4(b).

To start, turn off the sensitivity control on the swr meter and place the selector switch to indicate reverse or reflected power. At the transmitter end, feed about 5 Watts of unmodulated rf carrier to the 52-Ohm line. The frequency must be exactly the same as that to which the phase-shifting circuits were tuned. With the balun output terminals connected as described above, set the swr meter selector switch to forward and adjust the sensitivity control until the indicator reads exactly full scale.

Throw the selector switch to reverse and rotate C1 for the deepest indicated null, or dip. If the lowest null indication is not zero, move the balun output connections toward or away from the center of the coil, L1. It will be found that the correct points on the coil for a perfect match (zero reflected power) at the balun input terminal will be very critical. The tap adjustments will affect the resonant frequency of the circuit, L1/C1, and it will be necessary to readjust C1 each time that the tap positions are changed. The resonant circuit, L1/C1, should be placed in a waterproof enclosure. A large plastic sheet may be placed over the entire assembly, including the toroidal balun, and tied securely with nylon twine.

The arrangement shown in Fig. 6(a) uses a 12-turn coil made from No. 12 copper plastic-covered household wire. The coil diameter is 2

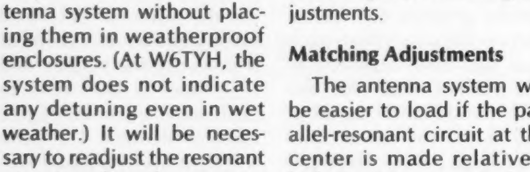
4 in. INSULATOR
L1
"DOORKNOB" CERAMIC
HIGH-Q
C1
500pF
5KV
a)
INSULATOR
L1
LOW-Q
C1
150pF
b)

Fig. 5. Phase-shift circuit details. L1 in a) is three turns 1/4" copper tubing, 2-1/2" diameter, 4" long. Spread or compress turns as indicated by arrows to resonate circuit to desired frequency. Narrow bandwidth but easier to load. L1 in b) is seven to eight turns of same-dimensions tubing, spread or compressed, providing greater operating bandwidth.

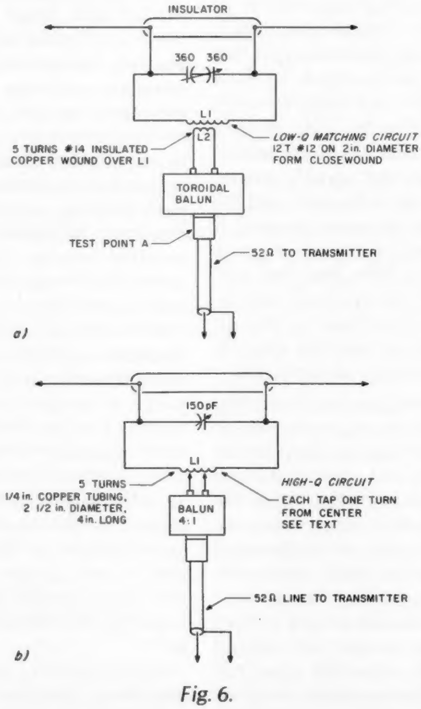
INSULATOR
360 360
L1
L2
5 TURNS #14 INSULATED
COPPER WOUND OVER L1
LOW-Q MATCHING CIRCUIT
12T #12 ON 2in. DIAMETER
FORM CLOSEWOUND
TOROIDAL
BALUN
TEST POINT A
52Ω TO TRANSMITTER
a)
150pF
L1
5 TURNS
1/4 in. COPPER TUBING,
2 1/2 in. DIAMETER,
4in. LONG
BALUN
4:1
HIGH-Q CIRCUIT
EACH TAP ONE TURN
FROM CENTER
SEE TEXT
52Ω LINE TO TRANSMITTER
b)

Fig. 6.

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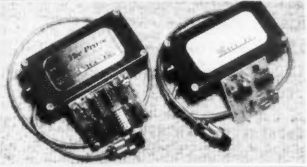

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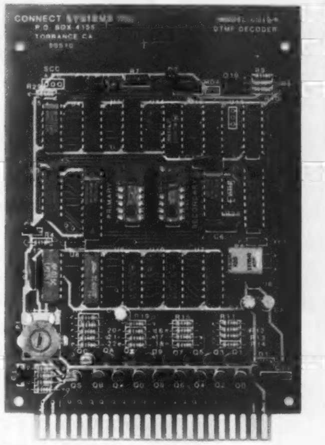

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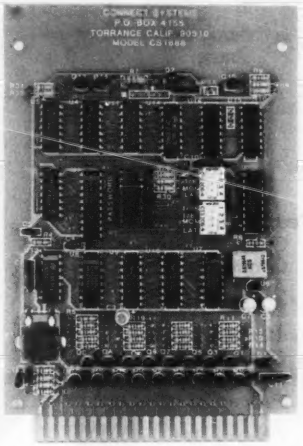

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2.	8 LATCHED	and	1 OF 8 SELECT
3.	8 MOMENTARY	and	8 LATCHED
4.	8 MOMENTARY	and	1 OF 8 SELECT
5.	1 OF 8 SELECT	and	8 MOMENTARY
6.	1 OF 8 SELECT	and	1 OF 8 SELECT
7.	1 OF 8 SELECT	and	8 LATCHED
8.	16 LATCHED		
9.	16 MOMENTARY		
10.	1 OF 16 SELECT		

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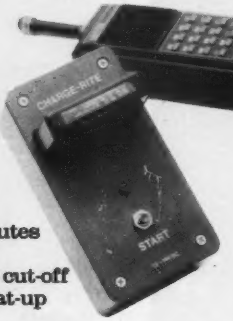

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inches and the turns are close-wound on a Bakelite™ tube. The coupling (link) coil, L3, consists of 5 turns of No. 14 fiberglass-insulated copper wire wound over the center of L2. The variable capacitor, C2, is a two-section type removed from an old AM broadcast radio. If the rf power to the antenna is over 100 Watts, use a capacitor with double-spaced plates. The common rotor terminal of C2 is connected to the aluminum case of the toroidal balun and the outside (shield) conductor of the 52-Ohm line.

The matching adjustments are the same as described above except that it may be necessary to adjust the number of turns in the coupling coil, L3. At W6TYH, we started out using three turns in L3 but found that five turns were required to produce proper loading at the transmitter with a 1:1 swr on the 52-Ohm line.

Antenna Supports

Our station, W6TYH, is located on a ranch in the foothills of the Sierras in Placer County, California, and the site is surrounded by many trees. The ham who uses trees to support his wire antenna systems must use ingenuity to keep them up during stormy or unusually windy weather. Fig. 7 shows how this problem was solved at W6TYH. Fortunately, we have two large oak trees about 85 feet apart, just about the right distance to support the center section of the array in the clear. Each tree has a large limb about 35 feet above the ground.

As shown in (a), a hook and pulley assembly is made up from a bicycle-storage hook and a small metal pulley to pass a 1/4-inch nylon rope. The hooks can be obtained at most bicycle shops or hardware stores. They come in pairs and are designed to screw into a garage wall or ceiling for hanging a bicycle or other objects. The pulley is securely fastened to the threaded end of the hook. The support rope should be 1/4-inch nylon rope and must run freely in the pulley without binding. I made the mistake of using a rope with a diameter too small for the pulley. It was necessary to lower the antenna with a dozen blasts from a 12-gauge shotgun (much to the annoyance of the XYL and the neighbors) after the rope stuck in the pulley.

After the antenna is pulled up to the desired height, a pair of five-gallon plastic pails are attached to the lower ends of the rope at each end of the array. Drill several 1/2-inch holes in the bottom of each pail to allow accumulated water to drain out. Fill each pail with just enough gravel so that the weight will keep the array in place but will allow the pails to move up and down during severe wind storms. I had just returned home from the hospital, about two years ago, when we had a severe storm with 75-mph winds. Several verticals and one three-element beam bit the dust (mud) but the 20-meter collinear remained in place. For two days I lay in bed, hooked up to an oxygen tank, and watched the plastic pails go up and down like elevators in a skyscraper. But the antenna stayed up.

The best performance will be obtained, of course, if all of the radiator sections are stretched out in a straight line as high above ground as possible. At W6TYH, because of interfering tree branches, the end sections slope toward the ground. The array appears to have a gain of about 5 or 6 dB in each direction in spite of the fact that the installation is not perfect. Because of the proximity of the ground to the ends of the radiators, it was necessary to adjust the length of each end section about 6 inches longer. We had expected that each section would require shortening. The sketch in Fig. 7(b) shows how the conductor length is adjusted.

I would be interested in hearing from readers who build this array. All letters will be answered if a stamped, self-addressed envelope is enclosed. ■

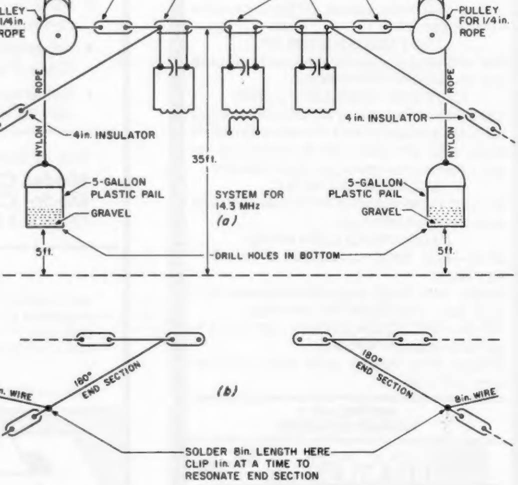

Fig. 7.

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Good to the Last Dot

Is there life beyond WX HR IS? With these practical tips you'll perk up every QSO and make every contact an adventure!

A surprising number of readers of *73* responded to the invitation, published in the September, 1983, issue, to "send me the tips you've discovered, the techniques you use to improve your on-the-air skills."

That invitation accompanied my article "How to Increase Your QSOs" which presented eleven "practical, QSO-tested techniques—specific information every Novice needs immediately after he or she has passed the FCC tests: tips and techniques about actual on-the-air operation."

Not only beginners can benefit from tips, however. As the article noted, many General-class operators, and even a good many Advanceds and Extras, make basic operating goofs. One reason may be the lack of such tips in standard operating manuals, handouts, instructional guides, and such material.

My tips came from two sources. Most came the hard way—from my own on-the-air experiences. The rest came from a poll I conducted of the 96-member US Naval Postgraduate School Amateur Radio Club in Monterey, California.

That article did not present techniques which are unusual or sophisticated. Rather, it detailed these quite basic techniques, most of which are usually unpublished or ignored:

- Using headphones
- Listening around the "Big Guns"
- Listening at a "hangout"
- Listening where there's no action
- Sending at a speed a bit beyond your skill
- Slowing your CW speed when you start fumbling
- Making your on-the-air time important to you
- Ignoring stations which "don't sound right"
- Knowing how to tune up
- Checking the action on other bands regularly
- Learning to live with QRM and QRN

A few days after the article was published, letters started arriving at my shack as hams across the country sent me additional techniques they find valuable. Here are the best of their suggestions.

KD3S

"I call this tip the negative CQ," wrote James F. Reid KD3S, of Laurel, Maryland. "I discovered it rather by accident. I had been calling CQ until I thought my arm would drop off and was getting no answer. I said to heck with it and tuned the rig to a quiet spot and sat back to read a magazine. Within five minutes somebody started calling CQ on my frequency. I called him back for a nice QSO. Since then I've had success with this trick several times. Just tune the rig to a quiet spot and wait. The QSOs will come to you."

K8GPT

Norm Hediger K8GPT, who operates from Dearborn, Michigan, sent some suggestions for the next step in QSOing. He wrote, "Along with making the contact is the problem of what to do *during* the contact." His tips include, and I quote:

1. When you operate, be alert and attentive to what you are doing and hearing. Sit in a comfortable position. Don't slouch—it's too easy to doze off or let your mind wander.

2. For making notes or copying, use a good pen or pencil—one that you are familiar with and which is comfortable to you. Don't try to get by with that old chewed-up stub that once was a pencil.

3. Use a decent size piece of paper for your notes—not just any scrap you can find. The reverse side of your log sheet makes a handy place to write notes. A clipboard or pad sometimes helps.

4. When copying, try writing everything in small letters. Printing and capital letters sometimes take more time and slow down your

speed. Also, don't try to write on your knee; use your operating desk or tabletop—something solid.

K1PLR/3

The importance of listening was emphasized in a letter sent by H. A. Arsenault K1PLR/3 of Erie, Pennsylvania. "I try to spend at least 15 minutes getting 'the lay of the land'"—listening up and down a band before going on the air. "You make no friends by loading up, tuning, and going on a blind frequency."

He also stressed the value of studying propagation predictions. "Be able to predict or understand what bands are open and when. It is most discouraging to put up a nifty antenna and call CQ on 10 meters until I turn blue in the face with no response, only to find out that my efforts coincide with the biggest solar flare in history."

Finally, K1PLR/3 pointed up the importance of brevity and of skill in using your equipment. "No one likes to contact someone who, with the aid of a keyer, takes ten minutes to send his name."

KA8DKT

Tuning techniques were detailed by Gary Sharpe KA8DKT of Toledo, Ohio. He wrote that while a ham sometimes needs to tune up on the air, "It seems most hams believe that you must tune up on exactly the frequency you are going to operate. For example, listen to any DX station—CW or SSB—and [you'll hear many] carriers [tuning up] during the contacts."

Gary then pointed out, "There is no commercially-made transmitter which tunes so sharply that an operator couldn't move as much as 30 kHz up or down the band to a clear spot to tune up."

He added, "My technique is to select a General-band area that I wish to operate in—usually 40-100 kHz wide. I then tune the transmitter up at the approximate middle of this band area, taking care not to interfere with any QSOs in progress.

"Now I am free to work stations or call CQ in a 100-kHz range without touching any controls on the transmitter except the vfo. Most transmitters and transceivers will operate at least ±40 kHz from the tune-up point quite satisfactorily. And even if the power output drops a few percent at the extreme ends of the bandwidth, a ham should know that it takes almost a 30% decrease in output power to make a noticeable difference at the receiving end—even in a pileup."

W9ALM

Six suggestions were sent in by William C. Caldwell W9ALM, of Kokomo, Indiana. Bill holds an Extra-class license and has been hamming for 46 years ("since I was 13—same call letters"). He works "mostly CW—99% since getting on the air." His advice is:

1. Listen before transmitting—learn how to use QRL? (Is the frequency busy?) This is very important because you may not be able to hear a station who is too close due to skip or band conditions.

2. Learn the "BK" QSO system. BK means "break-in"—not just "back to you." Since you need to send your callsign only every ten minutes, you can get a lot more information by not signing your call every time. Just send "BK" at the end of your message and the other station starts transmitting—if he knows the BK system.

3. Learn to combat QRM/QRN. If your rig has internal filters, use them. If not, try an external filter. Also learn how to ask for a QSY (a request to change frequency).

4. Use a tape recorder. Record QSOs to help improve your sending. This is the best way to learn how you sound at the other end. Simply put the microphone of the recorder near your speaker.

5. If you have more than one antenna for a given band, use a multiple-antenna switch. The antenna which gives the best reception will usually give the best transmitted signal.

6. Make schedules with hams you like to QSO. Real friendships can develop. Visit them when traveling near their QTH.

W0VS

Another ham who "operates almost exclusively CW" sent a good tip from Sierra Vista, Arizona. Jim Droege W0VS, wrote: "People who habitually run high speed—25+ wpm—can have a lot of trouble at slower speeds." The solution: Make a regular routine of sending at different speeds. Jim adds, "Variety [in your speed of sending CW] also seems to improve your accuracy."

Jim also added another advantage to using headphones, besides the benefits named in my September, 1983, article: Good phones increase the volume, focus your attention, sharpen your listening, reduce other sounds, and improve your operating. Jim's perceptive addition: "Phones also make my wife happy!"

W2HAE

Arthur C. Ford W2HAE, of Melbourne, Florida, submitted these tips:

1. The newcomer must be acquainted with his equipment—what it can or cannot do. The current transceivers are gems in flexibility if owners will take the time to read the manuals and experiment.

2. If the swr is poor, find out why and adjust the antenna for maximum efficiency or generally minimum swr.

3. Another overlooked item is the position of the antenna-loading switch. One position will give you the best match or efficiency.

4. Avoid CQing on top of a foreign broadcast carrier.

5. Pick an open spot as clean of QRM as you can find. Don't fight the heavy concentration [of stations, QRM, or QRN] in one band spot. Spread out. If 80 meters is QRN-plagued, shift to a higher band. And do not ignore 10 meters in the evening; look there for a nice solid QRM-free QSO.

6. Learn—by listening to other operators who are more experienced.

7. Avoid punctuation. The common "BT" should suffice on most occasions to separate thoughts or sentences.

8. Unnecessary QSZ (sending each word or group more than once) serves no purpose if you are sending at the proper speed to the other fellow.

9. Practice sending CW into a tape recorder, and copy your own sending for punishment.

10. After sending a CQ, rock the RIT control and sometimes you'll find someone calling you just enough off your frequency [so that you might not have heard him or her if you left your rig at the exact frequency on which you called].

Do such tips seem too basic for you? Then check again the second and third paragraphs of this article! These *are* intended to be tips Novices need as they first begin to operate. But don't be too cocky—many Advanceds and Extras also can be heard making basic operating goofs! ■

Do you have still more tips for increasing your QSOs—techniques which were not included either here or in my September, 1983, article? Please send them to me, so that we may publish another roundup of ideas. Include your call, name, and QTH so that you may be credited for your suggestions.

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This antenna should be of interest to mobile hams as well as indoor antenna users. It will let you go HF mobile without a whip.

The project started when I was trying to use a Hustler mobile whip-type antenna that uses three resonators. After having problems with mounting brackets and finding the whip to be a little too top-heavy, I decided to eliminate the 5-1/2-foot whip altogether. It's true that guy strings could have been used, but that would have made a rather unsightly lash-up.

Instead, I took an old Hustler 80-meter resonator and unwound its coil. I then used the coil as a mounting fixture for my HF rooftop antenna. I found a strong magnet-mount base (off of a CB antenna). The 80-meter resonator thread size is 3/4" #24 and the magnet mount was already countersunk, so it was a simple matter of using a 3/4" #24 nut to fasten the modified resonator to the magnet securely. The magnet must be strong enough to hold firmly onto the roof of the car at 60-65 mph.

Next, I drilled and tapped the top of the resonator to fit a 1/4" #20 bolt. I took the Hustler 3-resonator adapter plate and enlarged the center hole so it would fit snugly over the resonator. I fastened it in place with a 1/4" #20 bolt and lock washer. You now have a fixture for a roof-mounted, 3-resonator HF antenna.

I made a plastic-type plate, mounted a female coax connector (see photo), and drilled a couple of small holes through the resonator for mounting the plate. Note the three turns of #10 copper wire on the resonator. This serves only to connect the center conductor of the coax fitting to the resonator plate. A straight wire could have been used, but I thought it would look much better with three turns (and it does).

Don't forget to connect the ground lug of the coax connector to the base of the mount. When all three resonators were in place and everything was properly tightened, I sprayed the entire antenna with three coats of clear Rustoleum metal protector. This prevents weather damage.

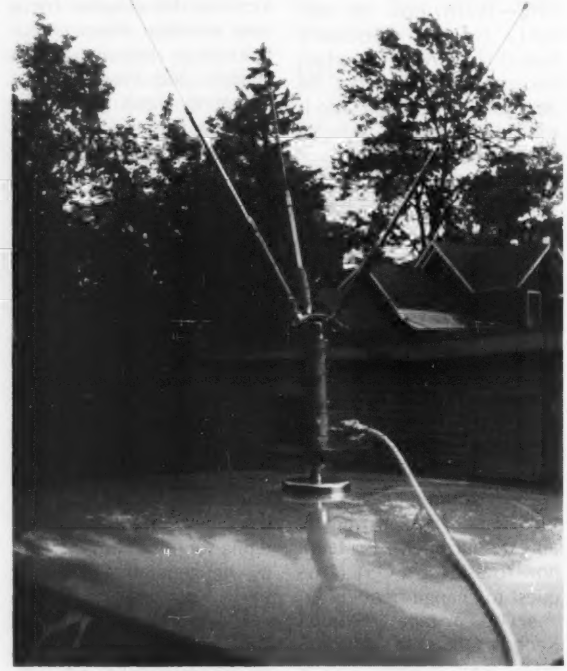
The height of the antenna from the rooftop to the 20-meter resonator tip is 32" (total height). The distance from the base to the top of the adapter plate is only 9-1/2".

Now for the on-the-air test. I was unable to adjust the resonators enough to get the swr lower than 2.8:1. This was no good! It was no doubt due to the close proximity of the resonators to the car roof. I still had no doubts that it could be made to work, so I bought a MFJ 940-B Versa Tuner. This solved the problem.

On any frequency within the 10-, 15-, and 20-meter bands, the tuner will bring the swr down to 1.1:1. The in-line wattmeter shows full output—100 Watts on 20, 90 Watts on 15, and 80 Watts on 10. (I'm using an FT-77 mobile rig.)

On-the-air performance has been very good. I think it is better than when I was using the whip. I believe this may be due to the tuner, which allows much sharper tuning of the antenna at a given frequency. When using the whip setup, if you vary the frequency more than 50 kHz, the swr changes rapidly and it is necessary to readjust the resonator—which is not always easy to do. With or without a whip, I highly recommend an antenna tuner!

There is no doubt that the radiation pattern is much different than that of a whip, but it seems to be a favorable difference. My signal reports have been excellent. All I can say is that it works, and I don't have to worry about the 5-foot whip and the mounting brackets. This antenna would also make a great indoor tabletop antenna when used with a tuner. 73.■



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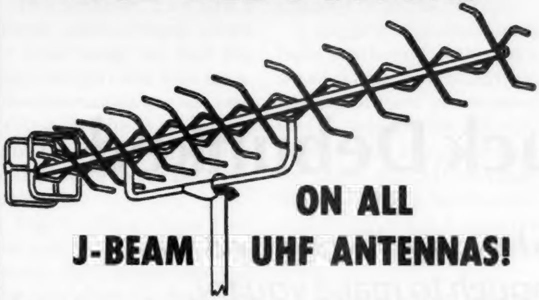

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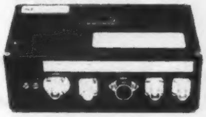

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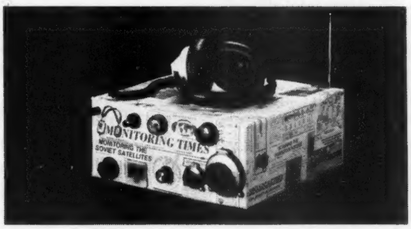

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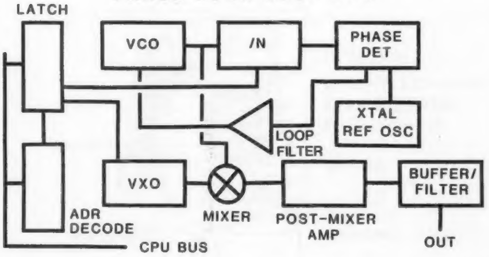

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The Rubber Duck Debunked

In ten minutes you can have 10 dB gain over your HT's duckie. It's enough to make you try.

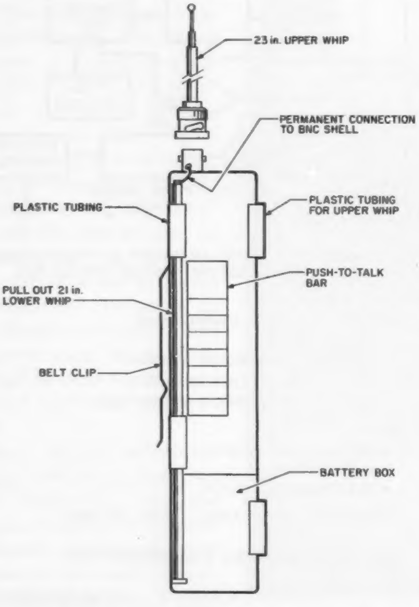
Sometimes with only an HT and a rubber ducky available, hams find that they can't quite bring up a much needed patch. A temporary way to boost power would be very useful. This article describes a simple antenna attachment which will boost power about 10 dB. It does not interfere with the portability of the radio.

How Bad Is It?

The typical ducky antenna used on hand-held radios has a large loss compared to a simple dipole. At 2 meters, for example, using a pull-out whip dipole from a portable TV, with each whip pulled out to 19.5" in length, fed with about 3 inches of 50-Ohm coax, and held vertically against the radio's side, 11.5-dB gain over the ducky was measured on a commercial field-strength instrument. The typical small TV dipole folds into a U shape about 1.5" × 10", and pulls out any distance up to 60". Although quite a good antenna, it is a bit clumsy to use.

A Better Way to Go

I settled for a less perfect simulated dipole which measured 9.5 dB better than the ducky. To make it, I used a regular BNC-fitted upper whip of 23" in length, replacing the ducky. A similar upside-down antenna, pulled out to 21" in length, made a lower dipole element. Its upper large end is grounded to either the radio chassis or the shell of the BNC connector on the radio. The lower whip is shorter to compensate for the effect of the chassis.


23 in. UPPER WHIP
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PLASTIC TUBING FOR UPPER WHIP
PUSH-TO-TALK BAR
PULL OUT 21 in. LOWER WHIP
BELT CLIP
BATTERY BOX

Fig. 1. HT antenna improvements.

Both whips can store on the radio's side by making a holster of 1" pieces of flexible plastic tubing into which the collapsed antennas slip. Cement the tubing to the radio's plastic case with instant glue. (Put the tubing on the side that will allow the battery to slide off if the collapsed antennas extend down that far.) The lower whip can be permanently attached to the radio so that it quickly pulls down when needed, and is out of the way when not in use.

Table 1 shows measured gains of antennas adjusted in length for the best field of radiation at 0° elevation angle. Variation in the length of the elements by an inch or two caused small variations in radiated field, which would be masked in practical use by much larger variations due to the holding position of the radio. Those variations are due to detuning and absorption effects of the body of the user, and are the price paid for extra small size and close holding.

Duck antenna	=	0 dB reference
20"	=	+7.5 dB better than duck
21" × 23" whips	=	+9.5 dB better than duck
39" TV dipole	=	+11.5 dB better than duck

Table 1. Experimental comparison on an ICOM 2AT at 146 MHz.

Unusual care getting precise lengths, good match, etc., is wasted effort. Almost any elements about the length mentioned cause a large increase in radiation, and the extra which could be gotten with precision will vanish at a slightly different hold of the radio.

Hand-held radios are designed to tolerate large swr ratios without damage, for they get these routinely as the unit is moved about in the hand when transmitting. The wise ham needing more power will get extra output by an antenna efficiency boost. The novice will strain his finals and reduce vswr immunity by using an overvoltage battery, to boost rf power.

Make-Do Is Good Enough

I suggest the practical ham use whatever whip he has, and if it pulls out too long, solder the extra end sections to the top bead so that it pulls out to the length he finds best. That will be good enough. We are after better practical performance, not a standard reference antenna.

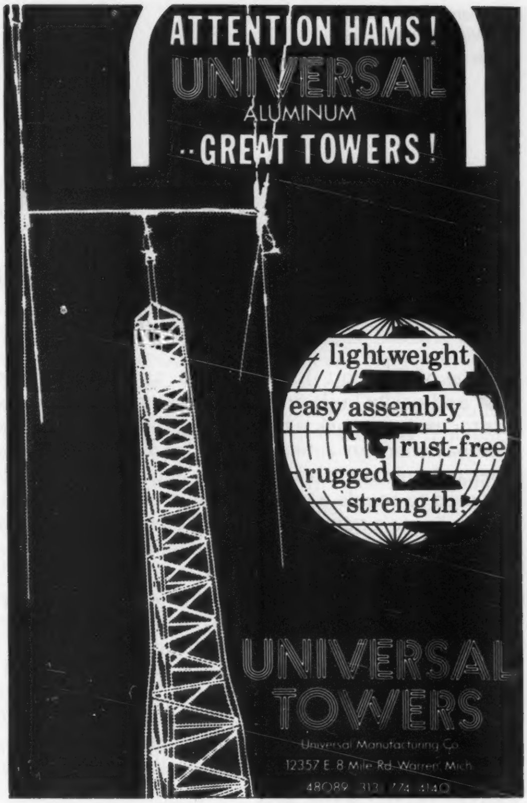
The tinkerer can use a simple field-strength meter at close range to find the best lengths for his radio. The dimensions are not very critical, but he may want to prove to himself that he has gotten close to the best possible.

Fig. 1 shows how I arranged an ICOM 2AT antenna. Both whips store on the side when the ducky antenna is being used.

All other hand-held radios which use whips working against the radio as a ground plane suffer similar loss and should experience similar improvement. The improvement is small above 1000 MHz, modest at 420, sizable at 220, large at 144, and enormous at 6 and 10 meters. This is directly related to how much smaller than a quarter wavelength the usual hand-held chassis is. Apparently, the added ground plane from the hand and body is canceled by the losses in the skin to the rf coupled from the chassis.

I suggest manufacturers build into hand-held radios a small-diameter collapsible whip pointed downward which would temporarily boost erp by a large amount for those difficult propagation conditions. Such an innovation would greatly increase the utility of hand units.

I personally used the concept of an extra, built-in, upside-down whip on the first CB hand-held radios in the 1950s. They desperately needed more ground plane, and the effect was quite impressive. Since the concept was not patented and some were sold, the idea is now presumed to be in the public domain, by my understanding of patent law. Therefore, commercial addition of this feature would be very inexpensive and greatly increase sales appeal.■



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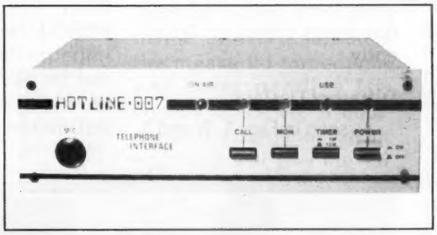

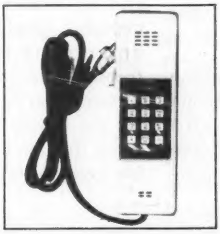

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The No-Baloney Lunchbox

We suggest you paint this antenna tuner before showing it to your friends.

One of the most useful and easily-built projects for the ham shack is the antenna tuner. An antenna tuner, or transmatch, is a device used to couple a transmission line to a transmitter, providing an artificial match between the antenna and the transmitter when the swr would otherwise be too high for proper operation. It does not actually correct the antenna mismatch, but "tricks" the transmitter into thinking the antenna is matched and therefore lowers the swr at the transmitter to an acceptable level. The capabilities of an antenna tuner can be handy in a variety of operating situations. Let's discuss antenna tuners in general before going into details about my "lunchbox" design.

One of the most common applications for the antenna tuner is combining it with a longwire antenna of random length, or other radiating devices such as window screens or bed frames, and tuning the antenna for each band as required. If the longwire antenna is not part of your present antenna system, there is still a definite need for an antenna tuner. If CW is your game, your antennas are probably optimized for the CW portion of the band, and vice versa for phone. Moving from the CW portion of the band to the phone portion can result in unacceptable swr readings, especially if your antennas are not particularly broadbanded and you are using a solid-state rig. This is where an antenna tuner can come in handy.

The unacceptable swr can be reduced to an acceptable level by inserting an antenna tuner in the transmission line along with an swr meter and adjusting it for the lowest swr. In most cases the line loss is negligible and the benefits far outweigh any trouble it might be to implement it into your system. Also, many solid-state transmitters have a built-in swr protection circuit that decreases power when the swr increases to unacceptable levels. Therefore, a low swr ensures full power to the antenna or amplifier. Antenna tuners also tend to attenuate harmonics from the transmitter; the amount depends on the design of the unit. A good antenna tuner can help reduce TVI considerably.

There are many different designs for antenna tuners, some more complicated than others. Among the different designs are the pi network, the T network, and the L network. They all use the same basic parts, but each has them arranged differently.

Different Designs

As seen in Figs. 1, 2, and 3, the main components of every design are the capacitor and the inductor. Each design differs not only in physical appearance but also in electrical characteristics. Let's take a look at each design and find what each has to offer.

First, let's look at the L-network antenna tuner (Fig. 1). It is known as a simple solution to what can be a big problem. It is a simple design that should be considered when contemplating an easy-to-build antenna tuner. It is ideal for coaxial-fed dipoles and longwire antennas. While usually it is thought of as a single-band tuner, the addition of taps to the coil and a variable capacitor provide much flexibility. The capacitor must always face the greater impedance, and a switch can be added to alternate the positions of R-in and R-out depending on the an-

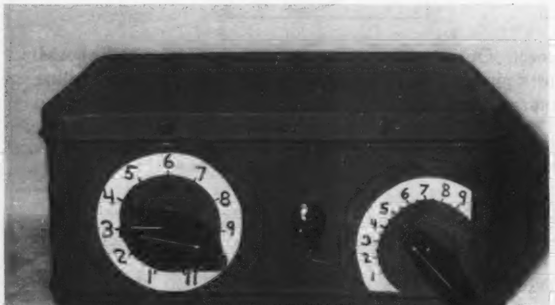

Photo A. Front panel of the lunchbox antenna tuner. Controls, from left to right, are: inductor taps, R-in/R-out switch, and variable capacitor.

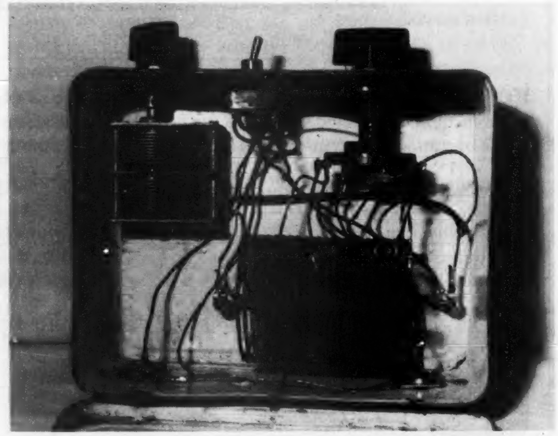

Photo B. Interior view of the lunchbox antenna tuner. Notice the arrangement of the parts in this L-network tuner.

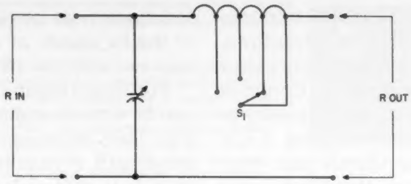

Fig. 1. An L network with variable coil taps (S_1). The capacitor should always be on the side of greater impedance. (R in > R out.)

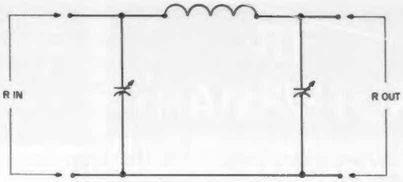

Fig. 2. A pi network which provides more flexibility than the L network. Notice the use of dual capacitors.

tenna characteristics. The L network is an excellent simple antenna tuner with a lot of potential.

The pi network (Fig. 2) is similar in design to the famous tuned circuit studied by so many for their ham license. Its design is also fairly simple, and the additional capacitor enables it to handle incredible mismatches with ease. This network provides more flexibility than the L network by eliminating the need for an R-in/R-out switch and giving better control over circuit Q.

The T network (Fig. 3) uses two capacitors and an inductor as in the pi network, but has them arranged differently. The T network is known for its sometimes poor harmonic attenuation. It becomes, in effect, a high-pass filter. If you use a T network, be sure to use it in line with a low-pass filter. However, another type of tuner, the SPC (Series Parallel Capacitance) transmatch, takes off from the T network and eliminates its poor harmonic attenuation. This "Ultimate Transmatch" is shown on page 19-11 of the 1981 edition of *The Radio Amateur's Handbook*.

Depending upon the situation, one antenna tuner design might be preferred over another. If a broad range of antennas and frequencies is to be used with the tuner and the antennas are nowhere near resonance, one of the more complicated designs may be required to correct the mismatch. Some antenna tuners are designed to feed balanced lines, and these often incorporate a balun in their design. If the antenna is fed with a balanced line, a balanced output from the tuner is a necessity. The design which was chosen for my multiple coaxial-fed dipoles was the simple L network, packaged somewhat differently.

As mentioned before, the main components of any antenna tuner are the inductors and capacitors. They are connected in some way, depending on the design, so that they form a tuned circuit which compensates for the mismatch between the transmitter output and the antenna system. The values of the inductance and capacitance required depend on the frequency and the nature of the antenna mismatch.

If you want to be exact, you can use a noise bridge or similar device to measure the input impedance of the antenna system at a given frequency. Then substitute the measured impedance and corresponding frequency in the Fig. 4 equations. The solutions to the equations will give the values the capacitor and inductor must have to give a proper match. A single-frequency device can use fixed values for the inductor and capacitor. However, for multi-frequency operation, do measurements and calculations for all frequencies the antenna will be used on and pick the highest component values of all the calculations. In most cases, a 365-pF capacitor and a multiple-turn (8 to 10 turns, 1½-inch diameter) inductor from the junk box will do just fine.

The L network provides excellent matching with a minimum of construction and design. Mine was designed for use with unbalanced lines only and does not contain a balun. Its design is simple and efficient, and I further simplified design considerations by paralleling the two 365-pF sections of a "broadcast" capacitor, using a 10-position switch for the inductor taps, and building it in a child's metal lunchbox.

Construction Ideas

All of the parts used in the construction of this L-network antenna tuner can be obtained quite inexpensively at local hamfests—and may be in your junk box. Two switches are needed, one multiple-pole rotary switch (at least one pole per band) and one ordinary DPDT switch. Some wire, two SO-239 coax connectors, and two pointer knobs make up the rest of the needed parts except for the most important two: the inductor and capacitor.

The next step in the construction process is obtaining the case so that each part can be placed for the best fit. A metal lunchbox with the handle and latch removed served as an ideal case for my tuner, being both convenient and cheap. (Portable and Field Day operators may choose to leave the handle on for easy transportation.) The hinged lid allows for easy access to the parts and a better case would be hard to find, regardless of cost. I added a few sheet-metal screws around the lid to improve the rf tightness of the box.

Once all the necessary parts are assembled, plan their arrangement in the case. Notice the arrangement of parts in the picture of the inside of my tuner (Photo B), and pay attention to the schematic (Fig. 6). Once you have a general idea of how all the parts will fit in the case, mark their locations, remove them, and prepare for mounting.

Drill the appropriate holes for the parts you have obtained and mount them. Make sure those parts which are to be grounded make good contact; scrape away

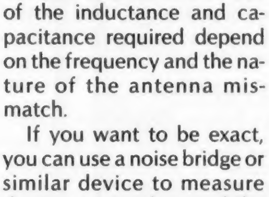

Fig. 3. The T network is known for its poor harmonic attenuation. It sometimes becomes a high-pass filter.

R in > R out

$$X_L = \sqrt{(R\text{ out} \times R\text{ in}) - R\text{ out}^2}$$
$$X_C = (R\text{ out} \times R\text{ in})/X_L$$

R out > R in

$$X_C = R\text{ out} \times R\text{ in}/(R\text{ out} - R\text{ in})$$
$$X_L = (R\text{ out} \times R\text{ in})/X_C$$

Fig. 4. The equations used for determining the needed inductance and capacitance for the tuner circuit as explained in the text. Use the proper equations as determined by the characteristics of your antenna system (i.e., if the antenna's impedance is greater than the output impedance of your transmitter, use the equations under R out > R in).

any paint or finish on the case. As a further precaution, I ran a separate ground wire to connect all circuit grounds. Wire the parts as indicated in the schematic, making any necessary adaptations that your particular design requires. Be sure that the coil and capacitor rotor do not touch the lid when the case is closed; I mounted my inductor on short standoffs. Decide if the wires from the rotary switch are to be soldered to the coil or if clips are to be used. Clips might be used during initial testing; the wires can be soldered to the coil after the ideal tapping positions for each band have been found.

To ensure that the capacitor is always to the high-impedance side, the DPDT switch has been incorporated in the design; it switches the input and output SO-239 connectors. You may leave the switch out if you are willing to reverse the input and output coax when needed. Once the parts are mounted and connected, the finishing work is ready to be done.

If your case's appearance was even close to that of mine, it will need to be painted. I used a flat grey spray paint which matches the color of my transceiver. Be sure to apply the paint in layers and be careful that it does not run and leave unseemly streaks on your case. For protection against scratches, rubber feet may be added.

After the paint has dried, labels need to be applied. They are necessary for fast retuning during band changes. Notice in the picture of the front panel that the knobs have numbered positions (Photo A). These homemade labels are easy to fabricate; take the appropriate measurements and cut the rings out of index cards or similar material. Temporarily place the rings over the knobs and mark the different switching positions. Then number the positions and glue the labels on with rubber cement. Make sure they are properly placed and easy to read: These labels are referred to often during the operation of the unit.

Operation

Now that the assembly is complete, the tuner is ready to be tested with your antenna system (see Fig. 5). Attach the coax from your antenna or antenna-switch box to one of the SO-239 connectors. Next, attach your swr meter to the other connector, using a short piece of coax if necessary. Finally, connect the swr meter to your transmitter.

Now the tuner is ready to be checked out under fire. At first it may seem difficult to use, and tuning the antenna can take a while. However, the more it is used, the easier it is to operate. Tune the transmitter to a vacant frequency where you plan to operate. Using the lowest power possible, key down the transmitter and quickly check the swr. Decrease the swr by tuning the capacitor and changing the taps on the inductor.

Do not keep the transmitter keyed down too long, and be sure to identify your station frequently. Continue to listen on the frequency to make sure it is clear; if it is not, tune slightly to a clear frequency. If the swr won't reduce to an acceptable level, switch the R-in and R-out and tune again. The swr normally can be reduced to roughly 1 to 1 in a matter of seconds. Record the final knob and switch settings.

I keep a note card with a table of CW- and phone-band settings for all frequencies of interest for each antenna. This way, whenever I want to operate on a certain frequency, I look it up on the card for the antenna I am using and set the tuner knobs and switch to the settings indicated on the card. Then I am instantly ready to operate on that frequency with an swr close to unity without any additional tuning. Soon you will begin to wonder how you operated without it.

Conclusion

For the multimode, multiband operator, an antenna tuner is almost a required station accessory, especially for those using solid-state rigs. However, building antennas carelessly and making up for it with an antenna tuner is not good practice. You can have a 1 to 1 swr into your transmitter and still have lots of losses in your antenna system. Watch out for feedline and ground losses. Fortunately, coaxial-fed dipoles can be operated in the HF bands at a fairly high swr with low losses.

Building antenna tuners can be a never-ending practice. They are so useful and serve such a vital function that it is difficult to get along without one. Usually, once one design is completed you'll want to try to build a "new and improved" version.

There are several useful accessories that can be incorporated into an antenna tuner. A built-in swr/wattmeter would eliminate the outboard swr meter. Also, a multiple-antenna switch could be added, possibly connected to a remote-relay antenna-switching system. A built-in 50-Ohm noise bridge can eliminate the need for on-the-air tuning. New experimental designs can always be fabricated with the parts already in use plus a few more. There is always room for upgrading.

The knowledge gained in building this simple lunchbox antenna tuner can be applied to all others, no matter how complicated. Antenna tuners are great fun to design, build, and use. They are simple to construct and make a great first project for the Novice. Tuners are always useful to have around.

Enjoy the freedom to roam around the bands using your antenna tuner. Read more about them in the books listed in the references and look over the different designs. I hope you have as much fun with your tuner as I have had with my lunchbox design. Never again let a high swr keep you from operating where you want. Good luck and happy hamming.■

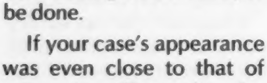

Fig. 5. The antenna tuner shown installed along with other station equipment.

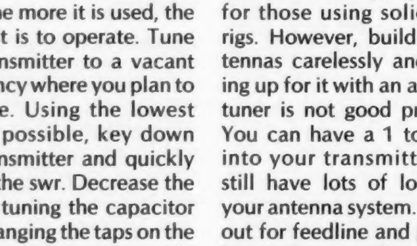

Fig. 6. Schematic of lunchbox L-network antenna tuner described in the text. L_1—multi-tapped inductor, C_1—variable capacitor, S_1—multiple-pole rotatable switch, S_2—DPDT switch.

References

The Radio Amateur's Handbook, 58th edition (1981), ARRL Publication, pages 19-10 to 19-14.

The ARRL Antenna Book, 14th edition (1983), ARRL Publication, chapter 4.

Radio Handbook, 21st edition, William Orr W6SAI, chapter 26.

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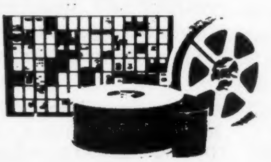

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Back in 1980 I wrote an article for *73* about the "Bobtailed Bobtail Curtain," using only two elements of the array.* It is worth noting that since then I have discovered that the inventor of the Bobtail had originally used only two elements, but when no one paid any attention to it, he added a third element to make it seem more interesting, and immediately it became more popular. The extra element does not add a great deal to the effectiveness of the array and the extra space it requires is not worth the extra results if you are short of space.

For some years I have used the antenna firing N/S to work Antarctica. I have made over 10,000 contacts there and have spent more than 25,000 hours running phone patches for the folks there. I can get a 5/9 report barefoot and break into a pileup anytime. Now, however, I have discontinued this operation after fifteen years and would like to use my Bobtail to fire E/W to work a couple of friends in Arizona and New Mexico.

I cannot rearrange the array to fire broadside E/W both because of space limitations and because I would have to fire through the house next door. I have used the array on ten meters for E/W endfire and also knew that I could do the same on 20 meters by increasing the spacing from half wave to full wave. In my 1980 article I mentioned this, but also said that it could not be rotated easily by any simple method. Now I have thought of a way to do it.

At first I thought it would be necessary to make two separate antennas, each with a voltage-feed unit of coil and capacitor, and put a quarter-wave delay between them. I could then fire E/W but could not easily switch from broadside N/S to E/W. Now, however, I realize that while I cannot change the actual spacing, I could change the delay electrically so that I would have an endfire pattern, from pattern #1 (Fig. 1, left) to pattern #2, (Fig. 1, center) very easily and instantly. The drawings will show how this is done. In the original way of increasing the physical spacing, I would get pattern #3 (Fig. 1, right), as I had done before. This was not what I really wanted.

The horizontal wire runs through some tree branches, so I used insulated wire. No problem was encountered. The ladder line or other spaced pair of wires will be suspended horizontally so that the end and switch B come just outside my radio-room window where I can easily reach it. Or, the addition of a half-wave multiple of line at B will make it possible to move the switch to anywhere you want it.

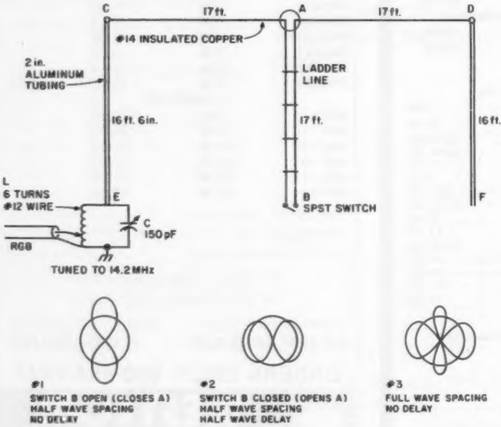

Fig. 1. Switching diagram.

***"The 20-Meter Double Bobtail," May, 1980, p. 44.**

When switch B is closed it will cause an electrical delay of a half wave, since A is open. The half wave is from A to B and back to A. The pattern is #2—endfire.

When B is open it presents a short to position A, as is the rule with quarter-wave lines. This makes pattern #1 half-wave spacing with no delay and is a broadside pattern N/S. If desired, the quarter-wave line can be dropped straight down to a stake or pulled off to one side where switch B can be mounted on a fence or tree.

A, E, and F are high-voltage points. B, C, and D are high-current points. The insulation requirements at B are very low, but the supports at E and F must be insulated well. The insulator at A must be a good one with adequate insulation and separation.

The dimensions given are for 14.2 MHz. The length of the verticals is 234/f, and the antenna separation is calculated as 246/f, where f is the frequency in MHz. The first is the antenna figure and the second is the free-space figure.

Tuning is the same as described in the original article in *73*, or as the Bobtail is normally tuned. Adjust L and C and the tap on the RG-8 for lowest swr. Tune for the center of the band, as it is not critical. Switching will not require a change in tuning. ■

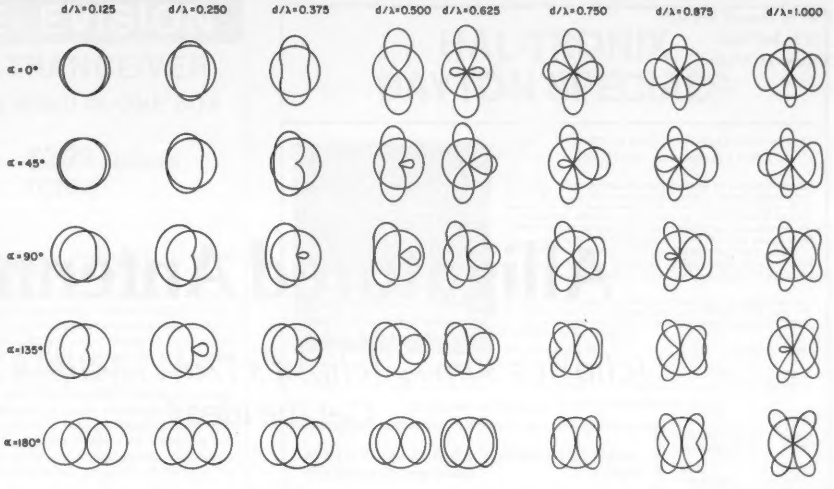

Fig. 2. Horizontal radiation patterns for an array of two antennas fed with equal magnitude currents.

This is the final antenna article—of many written for *73*—by W8HXR, who died November 25, 1984. A ham for 65 years, he authored *The Magic of Ham Radio* (a *73* publication, 1980), a non-technical book to guide the beginner as well as to reminisce with old-timers.

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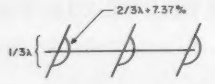

Fig. 1.

You now have a sagging-delta antenna (useful only on calm days and unguyed or low-height guyed towers) if you cut each wire for its appropriate use as a reflector, driven element, or director. With ingenuity, you can even figure out how to stop the wire from flopping in the wind. Since the radiation resistance of a delta/quad is about 100 Ohms (depending on various factors), expect a slightly higher swr—yet a very effective antenna. See your radio handbook on quad dimensions.

Suppose you have one of those great Bobtailed Bi-directional Broadside Curtain (BBBC) antennas (Fig. 2) and you want to change the direction of your signal without moving the antenna. Simple! Just add λ/4 elements with an alligator clip on each side of the center radiator at a distance of λ/4 (see Fig. 3).

It is no longer a BBBC, and you might need to fine tune your antenna tuner, but your signal now goes in the direction of the "curtain-rod."

And don't forget the old-fashioned method of broadening the resonance of your simple dipole antenna by adding short pieces of wire with alligator clips (see Fig. 4).

Mobile-hams have long known of this technique on 75- and 40-meter mobile antennas because the high Q of these antennas often limited the bandwidth (see Fig. 5).

It is a little trickier to try this on yagi beams, but it can work for a slight broadening of useful bandwidth.

Take a good look at that alligator clip—and think about it. What can you do with one? ■

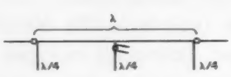

Fig. 2.

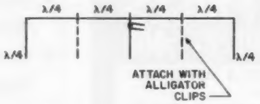

Fig. 3.

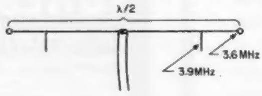

Fig. 4.

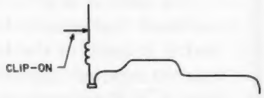

Fig. 5.

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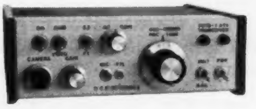

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Having tried a double-extended zepp on 450 MHz and approved of the results, I built one for 146. Even though I made the experimental model with number 14 wire, the bandwidth is good, but large-diameter tubing would be better. The wire suggests several methods of support. I used two pieces of 1″ × 2″ (screen stock) in the form of a T, braced by an 8″ × 12″ piece of plywood. The main section was nailed to the plywood, but the boom was bolted, for easier disassembly and transport.

The dimensions shown and measured in the graph make a good starting point. For frequency change, modify the radiating portion, and for match, massage the curved matching section. What you have is a 1.28-wavelength radiator fed with a continuously-varying tapered line. Probably the curve should be a hyperbola. This is a more forgiving match than the usual stubs. Gain should be 3 dB.

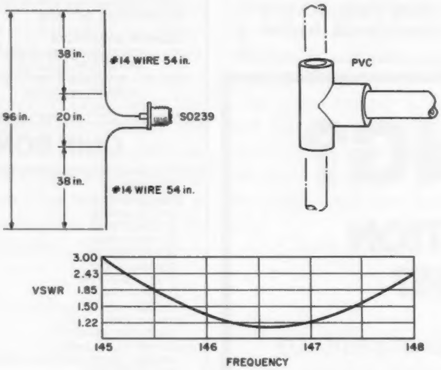

Fig. 1. Dimensions and details.

This antenna lends itself to a variety of mountings. You can side-mount it on a tower, stick it out a window, tape it up on a door or wall, hang it from a tree, or whatever. Since the high-voltage points are 20″ apart at the closest, the insulation is no great problem. Dry wood will do. PVC pipe (with a large-to-small T fitting) would be better, and you could simply tape the wire to the tubing, facilitating adjustment. For a plumber's delight version, you might try EMT and borrow the electrician's bending jig. Dimensions will vary as you change the diameter of the material.■

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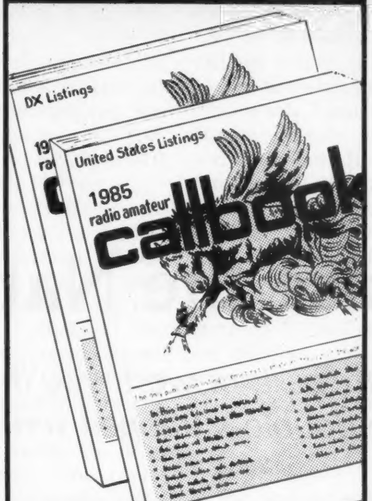

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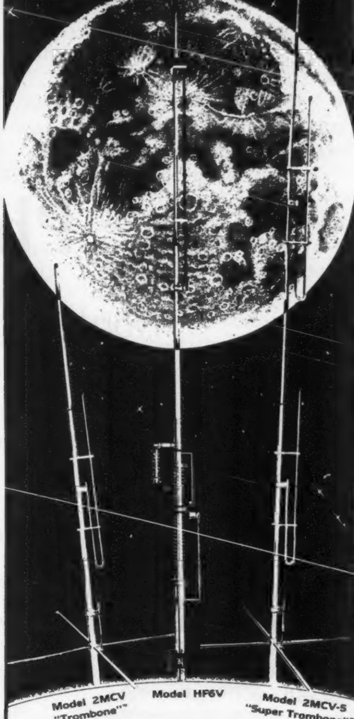

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Not wishing to give up multiband capability, I toyed with the idea of operating two trapped verticals in phase on 20 meters, and using one of the antennas for the other bands. Well, I decided to bite the bullet and try it out. Little did I expect the extraordinary results achieved!

As background, let me state that I have operated a Hustler 4BTV trapped vertical, ground-mounted with no radials, for eight years. This vertical works on ten through forty meters. I operate on the lower 25-kHz CW portion of 15, 20, and 40 meters, chasing DX with a barefoot HW-101, and have found that if I can hear them, I can work them. Thus, a trapped vertical has performed satisfactorily.

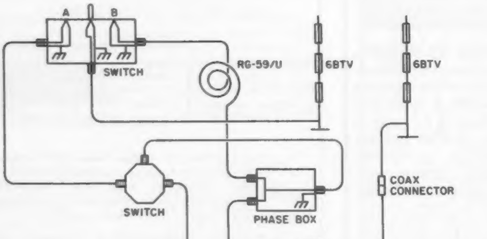

Fig. 1. Phased-vertical system diagram.

My plan was to ground-mount two Hustler 6BTV verticals to run in phase on 20 meters and operate the remaining bands on one of the antennas by means of a switch.

Theory

The theory of operating verticals in phase is quite simple, and the literature describes the effect of phasing clearly.[1] There are two main modes of operation; each has a figure-eight pattern of radiation and can be described as being either broadside or end-fire. By running the verticals in phase (0° phase shift), a broadside pattern is produced. Similarly, an end-fire pattern is achieved by feeding the verticals 180° out of phase. A simple phase change will effectively "swing" your signal to the desired direction.

I decided to erect the verticals in a north-south line and operate them in phase, producing a broadside pattern to the east and west. The antenna furthest from the house would be the one to run alone on bands other than twenty meters.

Construction

To obtain maximum directivity, the recommended spacing between the two antennas is one-half wavelength at the chosen operating frequency. The formula is: distance = (468 × vf)/f(MHz). Vf is the velocity factor of the coax, used when connecting the lines together and running a single line to the shack. This would only allow in-phase operation. In my setup, the verticals are phased with equal lengths of coax; therefore, I ignored the vf, and plugging in 14.0 MHz, the distance between the two verticals is 33.4 feet.

You will need to run equal lengths of coax from each antenna to the shack.

This requires some thought concerning how you will lay out and bury the feedline so as to account for the extra 33 feet of cable coming from the antenna nearest the house. I looped the near-antenna coax 15 feet towards the far antenna, then back again for 15 feet to take up roughly 30 feet. Two 125-foot sections of RG-8/U connect the antennas to the phasing system, which is located in the shack.

After tuning each vertical individually for the bands I was interested in, I built the 0° phase-shift box, shown in Fig. 1.[2] You could, of course, add 33 feet of coiled coax to one leg in the box to obtain an endfire pattern, but all of that cable would tend to be a little bulky.

Hustler states that the input impedance of the 6BTV is 52 Ohms, so it seemed that a direct connection in phase would be acceptable. However, things are never what they seem! After connecting the system, a terrible mismatch was observed. As was pointed out by W8HXR,[1] when the antennas are operated in parallel the impedance drops to 36 Ohms. Adding a quarter-wave transformer, made of RG-59/U, will improve the impedance match. The formula for the matching section is: length in feet = (246 × vf)/f(MHz), which, at 14.0 MHz, equals 13.2 feet.

Next, the switchbox was assembled (see Fig. 1). The switch is a 10-Amp, 125-volt DPDT type, which I purchased at Radio Shack (RS 275-1533). I enclosed the switch and coax connectors in a plastic box and used the inner conductor of some RG-58/U, stripped of the outer shield, for wiring the poles of the switch. The center connector of the switch runs directly to the far antenna. One side of the switch is connected to the RG-59/U which runs to the phase box, and the other side goes to the antenna switch using RG-58/U. Thus, by throwing a toggle switch, I can choose between phased- or single-vertical operation.

Upon testing, I found that not only was the swr below 1.5:1 on 20 meters, but also that the system worked on 15 and 40 meters as well. In other words, I could use the phased verticals on 15, 20, and 40 meters. The system functions with half-wave spacing on 20 meters, quarter-wave spacing on 40 meters, and three-quarter-wave spacing on 15 meters. Of course, the radiation patterns on 15 and 40 meters are different from the pattern predicted for 20 meters. Fig. 2 shows the theoretical plots.

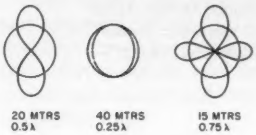

Fig. 2. Theoretical radiation patterns for three bands.

Conclusion

The final test was to operate the transceiver while prowling around the antenna site with a field-strength meter. Walking in a circle around the system, a figure-eight pattern was observed with major east-west lobes. The directivity was not as pronounced as the textbook's patterns but was certainly acceptable.

On the air, the results are gratifying. The broadside array snags DX regularly with 589 reports. For a high-performance antenna system that's easy to construct, you can't beat this phased-vertical array. ■

References

1. Jerrold Swank W8HXR, "Novice Guide to Phased Antennas," *73*, June and July, 1978.
2. Bill DesJardins W1ZY/LA0BP, "Phased Verticals for Easy DX," *73*, June, 1978.

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2- " " - 80, 40M	40 ft. "	$ 35 "
3- " NO-TRAP DIPOLE - 160, 80, 40M	113 ft. long	$ 71 "
2- " " " " - 80, 40M	85 ft. "	$ 55 "
9-BAND SPACE-SAVER DIPOLE - 160 thru 10M*	46 ft. long	$ 85 ppd

* Requires wide-range tuner (80, 40, 20, 15M without tuner)

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Where Am I Pointed?

Is this Sinclair beam-aimer program just like every other? Guess again.

It was *73* magazine that was responsible for developing my interest in 2m-FM operating through a large number of articles on that topic a few years ago. More recently, I started to read articles about home computers, and I must admit that I was very skeptical about the whole thing. My thinking changed as prices went down and as I did more reading on the topic, however, and when Clive Sinclair hit the market with the ZX-81 computer, I decided to make a move and invest.

Having the computer available, I looked into using it in various ham-radio applications. One obvious area was programming to compute the distance and direction to distant points—developing an antenna-aiming program.

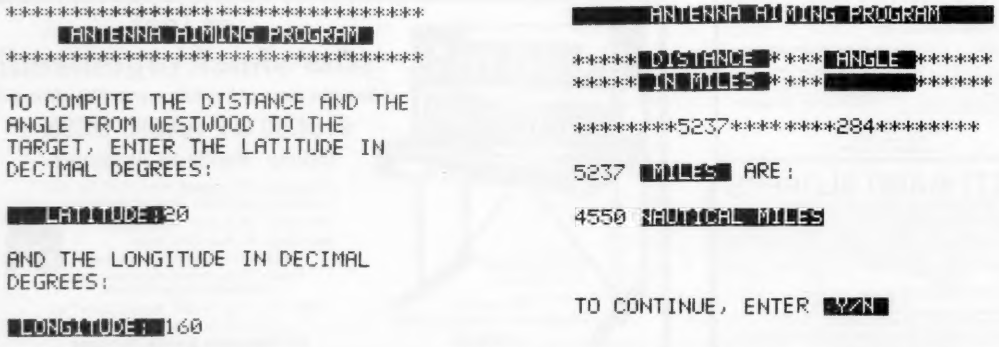
The starting point was to survey the literature and determine what had been published on the subject. I found three valuable sources of data, a necessary step since my spherical trig is very rusty. The texts that I used are listed below.

The Earth can be considered to be a sphere with a 3960-mile radius. The prime meridian is a circle that passes through Greenwich, England, to establish an arbitrary zero longitude. East and west longitudes start from this point and go to 180 degrees in each direction. In this program, west longitude is shown as a positive figure and east longitude is shown as negative. The equator marks the zero latitude reference, and latitudes go north and south from this point to 90 degrees at the two poles. In this program, north latitude is positive while south latitude is negative.

The first and second reference books contain actual programs for use on certain computers. Both are more complex than that needed for the Sinclair. This is due to the fact that the ZX-81 has the arc cosine function built into the system. Many low cost personal computers lack this feature, resulting in the use of other conventions in programming.

The Carroll text provides the basic formulas used in solving the problem of determining distance and angle. The program presented here uses these for the analytical portion of the program. The calculations are given in the box.

The program itself is fairly



```
*********************************
     ANTENNA AIMING PROGRAM
*********************************

TO COMPUTE THE DISTANCE AND THE
ANGLE FROM WESTWOOD TO THE
TARGET, ENTER THE LATITUDE IN
DECIMAL DEGREES:

   LATITUDE:20

AND THE LONGITUDE IN DECIMAL
DEGREES:

LONGITUDE: 160
```

```
          ANTENNA AIMING PROGRAM

*****DISTANCE****ANGLE******
*****IN MILES****     ******

********5237********284********

5237 MILES ARE:

4550 NAUTICAL MILES


TO CONTINUE, ENTER Y/N
```

Sample runs.

simple. The following notes will clarify key points:

- Lines 5-88 set up the display and prompt input of the target location.
- Lines 90-180 perform the computations.
- Lines 183-265 control the display of the calculation.
- Line 45 should be changed to show your own QTH. The program listing shows Westwood, which is my QTH.
- Lines 100 and 105 should be changed to reflect the user's latitude and longitude.

Finally, be very careful to enter the program exactly as shown. The omission or addition of a parenthesis may cause problems with the output. Once loaded, the program can be tested before being placed in use. The ARRL *Antenna Handbook* for 1968 gives the following sample computation:

Location	Lat.	Long.
Chicago	41.9°	87.6°
Cairo	30.0°	−31.2°

Note that Cairo has an east longitude, a negative figure. The bearing from Chicago to Cairo is 49.3° with a distance of 6106 statute miles or 5306 nautical miles. To use these figures, substitute the Chicago data for LA1 and LO1 and enter the Cairo data as the target. The program will provide a good match to the *Handbook* result.

Once tested, the latitude and longitude for your QTH may be entered for LA1 and LO1. The program can be stored and loaded with the name ANTAIM.

Good luck with the program! I have found it to be very useful in itself and a good demonstration program for anyone who wants to know what the computer can do that is of practical value. ■

CALCULATIONS

$C = (\sin LA1 * \sin LA2) + [\cos LA1 * \cos LA2 * \cos(LO2 - LO1)]$

$D = (60 * \text{arc cos } C)$

$G = [\sin LA2 - (\sin LA1 * \cos D/60)]/\sin (D/60) * \cos LA1$

$H = \text{arc cos } G$

LA1 and LA2 are local and target latitudes, LO1 and LO2 are local and target longitudes, C and G are intermediate computations, D is the distance in nautical miles, and H is the angle to the target.

The next item to consider is whether or not the angle determined for H is from 0 to 180 degrees or if it is between 180° and 360°. This is calculated by:

$J = \sin(LO2 - LO1)$

If $J \geq 0$ then let $H = 360 - H$

References

1. ***80 Practical Time Saving Programs for the TRS-80***, C. J. Carroll, Tab Books, 1982.
2. ***The Giant Book of Computer Software, 73 Magazine***, Tab Books, 1981.
3. ***Plane and Spherical Trigonometry***, Nielsen and Vanlonkhuyzen, Barnes and Noble, 1968.

Program listing.

```
  5 REM "ANTAIM
"
 10 PRINT

 15 PRINT

 20 PRINT "****
****************
************"

 25 PRINT "
 ANTENNA AIMING 
PROGRAM "

 30 PRINT "****
****************
************"

 35 PRINT

 40 PRINT "TO C
OMPUTE THE DISTA
NCE AND THE"

 45 PRINT "ANGL
E FROM WESTWOOD
TO THE"

 50 PRINT "TARG
ET, ENTER THE LA
TITUDE IN"

 55 PRINT "DECI
MAL DEGREES:"
 60 INPUT LA2

 63 PRINT

 65 PRINT "   L
ATITUDE: ";LA2
 68 PRINT

 70 PRINT "AND
THE LONGITUDE IN
 DECIMAL"

 75 PRINT "DEGR
EES:"
 78 PRINT

 80 INPUT LO2

 85 PRINT " LON
GITUDE:  ";LO2
 88 PRINT

 90 LET A=PI/18
0
 95 LET B=1/A

 100 LET LA1=42.
23*A
 105 LET LO1=71.
23*A
 110 LET LA2=LA2
*A
 115 LET LO2=LO2
*A
 120 LET C=(SIN
LA1*SIN LA2)+(CO
S LA1*COS LA2*CO
S (LO2-LO1))
 125 LET D=60*(A
CS C*B)

 130 LET E=D*1.1
51
 135 LET F=(D/60
)*A
 140 LET G=((SIN
 LA2)-(SIN LA1*C
OS F))/(SIN F*CO
S LA1)

 145 LET H=ACS G
*B
 150 LET J=SIN (
LO2-LO1)*A
 155 IF J>=0 THE
N LET H=360-H
 160 LET L=INT (
D+.5)
 165 LET M=INT (
E+.5)
 170 LET O=INT (
H+.5)
 175 CLS

 180 PRINT

 183 PRINT "    
  ANTENNA AIMING
 PROGRAM       "

 185 PRINT

 190 PRINT "****
* DISTANCE **** 
ANGLE ******"

 195 PRINT "****
* IN MILES **** 
       ******"

 200 PRINT

 205 PRINT "****
****";M;"*******
*";O;"********"

 210 PRINT

 215 PRINT M;"  
MILES  ARE:"
 218 PRINT

 220 PRINT L;" N
AUTICAL MILES"
 225 PRINT

 226 PRINT

 227 PRINT

 230 PRINT "TO C
ONTINUE, ENTER  
Y/N "

 235 INPUT P$

 240 IF P$<>"Y"
THEN STOP
 245 CLS

 250 GOTO 35

 255 CLS

 260 SAVE "ANTAI
M"
 265 GOTO 5
```

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SPECIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every annoncement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine *by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices,* 73 Magazine, *Pine St., Peterborough NH 03458.*

CEDARBURG WI
MAY 4

The Ozaukee Radio Club, Inc., will sponsor its seventh annual swapfest on Saturday, May 4, 1985, from 8:00 am to 1:00 pm, at the Circle B Recreation Center, Highway 60, Cedarburg WI (20 miles north of Milwaukee). Admission is $2.00 in advance and $3.00 at the door. Four-foot tables are $2.00 each and are available in advance only. Refreshments will be available. Seller setup begins at 7:00 am. For tickets, tables, maps, or more information, send a business-size SASE to 1985 ORC Swapfest, 101 E. Clay Street, Saukville WI 53080.

ROGERS AR
MAY 4

The Northwest Arkansas Amateur Radio Club, Inc., will hold its fifth annual hamfest/swapfest on Saturday, May 4, 1985, from 8:00 am to 4:00 pm, at the Rogers Youth Center, 315 West Olive, Rogers AR. Setup begins at 7:00 am. Admission is free, and commercial and flea-market tables are $2.00—first come, first served. Talk-in on 146.16/.76 and 146.52 simplex. For more information, send an SASE to either Ray Watson N5HAP, 714 Maple Drive, Springdale AR 72764, or to Dave Perry KE5QZ, 3201 N. 13th Street, Rogers AR 72756.

BEMIDJI MN
MAY 4

The Bemidji Amateur Radio Club will hold its annual hamfest/swapfest on Saturday, May 4, 1985, from 9:00 am to 4:00 pm, at the Middle School cafeteria, Bemidji MN. Licensing exams will be given. Talk-in on 146.13/.73. For more information, write Jerry Pottratz, Bemidji Amateur Radio Club, PO Box 524, Bemidji MN 56601; (218)-751-7502.

OLD-TIMERS DAY
MAY 4

The Volunteer Amateur Radio Club of Dickson TN will operate special-event station NY4N on Old-Timers Day, May 4, 1985. Times and frequencies are as follows: 12:00 noon to 2:00 pm—3980 kHz; 2:00 pm to 6:00 pm—14,275 kHz; 12:00 noon to 6:00 pm—146.520 and 145.11 MHz. For a commemorative certificate, QSL to PO Box 74, Burns TN 37029.

OWEGO NY
MAY 4

The Southern Tier ARC will sponsor its 26th annual hamfest on Saturday, May 4, 1985, beginning at 8:00 am, at the Treadway Inn, Owego NY (take NY Route 17 to Exit 65). Admission is $4.00, with children under 14 admitted free. Flea-market/tailgating parking is $2.00 (plus admission for each person). Features include vendor displays, talks, and refreshments. There will be a dinner at 6:30 pm ($15.00, includes general admission—advance tickets only). For banquet tickets (make checks payable to STARC), write to STARC, PO Box 7082, Endicott NY 13760. Talk-in on .22/.82, .16/.76, and .52. For more information, send an SASE to KF2X, RD #1, Box 144, Vestal NY 13850.

COCHISE COUNTY AZ
MAY 4–5

The Cochise Amateur Radio Association (CARA) invites all amateurs to participate in the dedication of the new CARA Training Facility and Range. The inaugural event for the complex will be a hamfest on May 4–5, 1985. A flea market is planned and tailgaters are welcome. The new facility is located 5 miles east of Sierra Vista AZ on Moson Road, off of Highway 90 East. For more information, contact the Cochise Amateur Radio Association, PO Box 1855, Sierra Vista AZ 85636, Attn: KB7HB.

GREENVILLE SC
MAY 4–5

The Blue Ridge Amateur Radio Society will sponsor the 46th annual Greenville Hamfest and Electronics Flea Market on Saturday, May 4, 1985, from 8:00 am to 5:00 pm, and Sunday, May 5, 1985, from 8:00 am to 3:00 pm, at the American Legion Fairgrounds, Greenville SC. Admission is $3.00 in advance and $4.00 at the gate. There will be licensing exams, a Wouff Hong ceremony, the South Carolina ARRL State Convention, 25,000 square feet of dealer displays, an indoor/outdoor flea market, a Saturday-night banquet, camping, and more. For advance tickets or for VEC exam information, write Mrs. Sue Chism N4ENX, PO Box 6751, Greenville SC 29606. For more information, contact Mr. Rancy Rice WD4ADK, 1401 W. Parker Road, Greenville SC 29611.

SHELTON WA CENTENNIAL
MAY 4–5

The Mason County ARC will be operating special-event stations on May 4–5, 1985, to celebrate the centennial of Shelton WA. KB7MJ and W7KTI will be operating SSB on 3900, 7230, 14,270, 21,350, and 28,600. KN7D will be operating RTTY on 14,090. K7UAR will be operating packet on 145.01. For a certificate, send a QSL and a 9 × 12 SASE to Loren Mercer KA7GSV, 2213 Olympic Highway North, Shelton WA 98584.

MELVILLE NY
MAY 5

The Suffolk County Radio Club will sponsor an indoor/outdoor electronics flea market on Sunday, May 5, 1985, from 8:00 am to 3:00 pm, at Republic Lodge #1987, 585 Broadhollow Road (Route 110), Melville NY. Admission is $2.00 (spouses and children under 12 are free). Indoor sellers' tables are $7.00 and outdoor space is $5.00 and includes one free admission. Free parking and refreshments will be available. Talk-in on 144.61/145.21 and 146.52. For more information, call Richard Tygar AC2P at (516)-643-5956 evenings.

SULLIVAN IL
MAY 5

The Moultrie Amateur Radio Klub (MARK) will hold a hamfest on Sunday, May 5, 1985, from 8:00 am to 3:00 pm, at the Moultrie County 4-H Fairgrounds, five miles east of Sullivan IL. There will be a heated indoor and large covered outdoor flea market. There is no charge to vendors, and space is available on a first-come, first-served basis. Vendors can set up on Saturday, May 4, but there are no overnight hookups. Talk-in on .655/.055 and .52. For more information, write MARK, PO Box 79, Sullivan IL 61951, or call Vernon Jack K9SWY at (217)-728-7596.

CENTRALIA IL
MAY 5

The Centralia Wireless Association, Inc., will hold its annual hamfest on Sunday, May 5, 1985, at the Kaskaskia College gymnasium, three miles northwest of Centralia IL. Flea-market and display setup will begin at 7:00 am. Admission is free and a limited number of tables will be provided on a first-come, first-served basis. Food and free parking will be available. Talk-in on 147.27/.87. Examinations for all classes of license (except Novice) will be given at 9:00 am. To register for the exams, send (by April 5) an FCC Form 610, a copy of your current license, and a check for $4.00 (payable to ARRL/VEC) to Lou Hodges W9IL, Route 1, Box 62A, Centralia IL 62801. For more information, contact David Conder KA9QPC at (618)-532-2772 or Lou Hodges W9IL at (618)-533-4724.

ROSEVILLE CA
MAY 5

The 13th annual Sacramento Valley Amateur Radio Hamswap will be held on Sunday, May 5, 1985, from 9:00 am to 3:00 pm, at the Placer County Fairgrounds, Roseville CA. Swap tables will be available. There will be food and free parking. Talk-in on 145.190 and 224.780 (K6IS repeaters). For ticket and table information, contact Carl Schultz KA6KWB, 2942 Gwendolyn Way, Rancho Cordova CA 95670; (916)-366-9111.

SANDWICH IL
MAY 5

The Kishwaukee Amateur Radio Club will hold its annual hamfest on Sunday,

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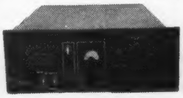

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May 5, 1985, at the DeKalb County Fairgrounds, on Suydam Road just north of Route 34, between Routes 23 and 47. Admission is $2.00 in advance and $3.00 at the gate. Inside display tables are $5.00 each. All parking is free and there will be outside areas for tailgating. Overnight camping will be available (no hookups). Food will also be available. Talk-in on 146.94 and 146.13/.73. For more information or for tickets, write to KARC, Box 334, Sycamore IL 60178.

WEST SPRINGFIELD MA
MAY 5

The Hampden County Radio Association will hold a flea market on Sunday, May 5, 1985, rain or shine, from 9:00 am to 3:00 pm, at the Elks Lodge, Morgan Road, West Springfield MA (Morgan Road is approximately one-half mile south of the Massachusetts Turnpike on Route 5. Turn right onto Morgan Road at Abdows Restaurant and drive three-quarters of a mile to the Elks Lodge). Admission is $1.00 and tables are $3.00 each. Dealers may display from vehicles for $3.00 per vehicle. Refreshments will be available.

BBQ FESTIVAL
MAY 10–11

The Owensboro ARC will operate K4HY from the International BBQ Festival, from 0000 UTC on May 10, 1985, through 0530 UTC on May 11, 1985. Frequencies of operation will be: phone—7245, 28540, and 28815; CW—7125. A certificate is available for an SASE to Ray Tate N4EKG, 1615 East 23rd Street, Owensboro KY 42301.

DULUTH MN
MAY 11

The Arrowhead Radio Amateur Club will sponsor Swapfest 85 on May 11, 1985, from 10:00 am to 3:00 pm, at the Holiday Inn, 207 West Superior Street, Duluth MN. May 11 has been proclaimed "Amateur Radio Day" by the mayor of Duluth. Admission is $4.00 and 4-foot tables are $5.00. Setup begins at 8:00 am. There will be plenty of food and free parking. Other activities include a cocktail hour, a banquet ($15.00), and much more. Talk-in on .34/.94. For admission, table or banquet advanced registration, or Holiday Inn room rates, contact Bill Cossette N0BKL, 15 Manitou Street, Duluth MN 55808; (218)-624-7188.

CADILLAC MI
MAY 11

The Wexaukee Amateur Radio Association will hold its 25th annual Swap Shop and Computer Fair on Saturday, May 11, 1985, at the Wexford Civic Arena, Cadillac MI. Camping will be available. Transportation will be available for anyone wishing to fly in. Talk-in on 146.37/.97 (WA8SUE). For more information, contact Wexaukee Amateur Radio Association, PO Box 163, Cadillac MI 49601.

FIRE SERVICE RECOGNITION DAY
MAY 11

Fire Service Recognition Day will be celebrated by special-event station KF6XX on May 11, 1985, from 1700 to 2200 UTC. KF6XX (the call held by Bill Bisson, the Los Angeles Fire Department's Arson Section Battalion Chief) will be operated from Los Angeles City Fire Station 88, 5101 Sepulveda Boulevard, Van Nuys CA, on 15- and 20-meter SSB. On display at Fire Station 88 will be equipment from local fire-fighting agencies, including helicopters, tractors, bulldozers, and all types of fire engines and trucks. Fire prevention and lifesaving techniques will also be demonstrated. All licensed hams are welcome to stop by operating headquarters, the Arson Section Response Van, to sign the guest log and operate. Custom QSO confirmation certificates are available for a QSL sent to KF6XX, PO Box 939, Camarillo CA 93010.

BATON ROUGE LA
MAY 11–12

The Baton Rouge Amateur Radio Club will hold its annual hamfest on Saturday and Sunday, May 11–12, 1985, from 8:30 am to 5:00 pm on Saturday, and from 8:30 am to 2:00 pm on Sunday, at the campus of Catholic High School, Baton Rouge LA. Admission is free. Featured will be a swapfest, forums, and new-equipment dealers. Talk-in on 146.79 –. There will be VE exams (through Extra class) from 9:00 am to 12:00 noon on both days. There is a 30-day advance registration deadline for the exams. Send an SASE, Form 610, and a check for $4.00 payable to ARRL/VEC to George Perry W5LVX, 17424 Lady Constance, Greenwell Springs LA 70739. For further information, send an SASE to Rick Pourciau N5HHF, 879 Castle Kirk Drive, Baton Rouge LA 70808.

MEDINA COUNTY OH
MAY 12

The Medina Two Meter Group will sponsor the Medina County Hamfest on May 12, 1985, from 8:00 am to 2:00 pm, at the Medina County Community Center Building, Lafayette Road, State Route 42 SW, Medina County OH. Admission is $3.00 in advance and $3.50 at the door. Tables are $6.00 each and flea-market spaces are $2.00 each. Setup begins at 7:00 am. Refreshments and free parking will be available. Talk-in on 147.63/.03 (K8TV/R). For more information, table reservations, or advance tickets, contact the Medina County Hamfest, PO Box 452, Medina OH 44258; (216)-725-5021.

CHICAGO IL
MAY 15

The Chicago Amateur Radio Club (CARC) will hold a mini-hamfest on Wednesday, May 15, 1985, from 6:00 pm to 10:00 pm, at the Edgebrook Golf Course field house, 5900 N. Central Avenue (north of Elston Avenue, south of Devon Avenue), Chicago IL. For more information, call (312)-545-3622.

MANASSAS VA
MAY 18

The Ole Virginia Hams Amateur Radio Club of Manassas VA will sponsor a special-event station on May 18, 1985, from 8:00 am to 8:00 pm, at the Manassas Battlefield Park, Manassas VA. Frequencies will be: Novice—3.725, 7.125, and 21.050; General phone—3.950, 7.290, 14.290, and 21.390; General CW—3.650, 7.050, 14.050, and 21.050. QSL to Ole Virginia Hams ARC, PO Box 1255, Manassas VA 22110.

ARMED FORCES DAY 1985
"PRESERVING THE PEACE"
MAY 18

The annual Armed Forces Day Communication Test will be held on Saturday, May 18, 1985, and marks the 36th anniversary of this event which emphasizes a continuing climate of mutual assistance and warm esteem between the military and amateur-radio communities. The traditional military-to-amateur crossband operation and broadcast of the Secretary of Defense message are the featured highlights of the day, which includes operation in CW, SSB, RTTY, and SSTV.

These tests give both amateur-radio operators and SWLs an opportunity to demonstrate their individual technical skills. Special commemorative QSL cards will be awarded to those amateur-radio operators achieving a verified two-way radio contact with any of the participating military radio stations. Interception of these contacts by SWLs will not be acknowledged by QSL cards. However, anyone who receives and accurately copies the Armed Forces Day CW and/or RTTY message from the Secretary of Defense can qualify to receive a special commemorative certificate from the Secretary.

Crossband contacts: The military-to-amateur crossband operations will be conducted from 1300 UTC on May 18 to 0245 UTC on May 19. The military stations participating in crossband operations will be:

AIR
2045th Comm. Group
Andrews AFB
Washington DC

NAM
Naval Comm. Area
Master Station LANT
Norfolk VA

NAV
Hq. Navy-Marine Corps
MARS Radio Station
Cheltenham MD

NMH
Coast Guard Radio Station
Alexandria VA

NMN
Coast Guard Comm. Station
Portsmouth VA

NPG
Naval Comm. Station
Stockton CA

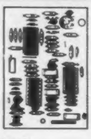
NPL
Naval Comm. Station
San Diego CA

NZJ
Marine Corps Air Station
El Toro CA

WAR
Hq. Army MARS Radio Station
Fort Meade MD

Military stations will transmit on the following frequencies and announce the specific amateur band frequency being monitored:

Frequency (kHz)	Emission	Station
4001.5	LSB	NPG
4010.0	CW	NPG
4015.0	CW	NMH
4025.0	LSB	AIR
4028.5	LSB	WAR
6970.0	CW	NPG
6995.5	CW	AIR
6997.5	CW	WAR
7301.5	LSB	NPG
7306.5	RTTY	AIR
7315.0	LSB	AIR
7346.5	LSB	NMH



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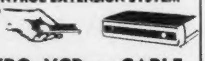

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10259.5	CW	NPG
13514.0	RTTY	WAR
13927.5	RTTY	NPG
13975.5	CW	NPG
13986.5	RTTY	AIR
13992.5	USB	WAR
13997.5	CW	AIR
14375.0	USB	NPG
14385.0	SSTV	NPL
14389.5	SSTV	NAV
14400.0	Varied	NAM
14403.5	CW	WAR
14408.0	USB	AIR
14440.0	RTTY	NMH
14480.0	USB	NZJ
20937.5	USB	NMH
20995.5	USB	WAR
20998.5	CW	NPG
21460.0	USB	NPG

Receiving test: The CW and the RTTY broadcasts will be special Armed Forces Day messages from the Secretary of Defense to any amateur-radio operator or SWL desiring to participate. A 10-minute tuning call will precede each transmission. The CW broadcast will be transmitted at 25 wpm beginning at 0300 UTC on May 19. The RTTY broadcast will begin at 0345 UTC on May 19 at 60 wpm using 170-Hz shift. Both the CW and the RTTY broadcast will be transmitted from the following stations on the listed frequencies:

AIR—6995.5, 13997.5
NAM—4005, 7393, 14400
NAV—7372.5, 14389.5
NPG—4010, 7365, 13975.5
WAR—4028.5, 6997.5, 14403.5.

Submission of test entries: Transcriptions of the CW and/or RTTY receiving tests should be submitted "as received." No attempt should be made to correct possible transmission errors. The time, frequency, and callsign of the military station copied as well as the name, callsign and address of the individual submitting the entry must be indicated on the page containing the test message. Entries must be postmarked no later than May 25, 1985, and submitted to the respective military commands as follows: AIR—Armed Forces Day Test, 2045CG/DONJM, Andrews AFB, DC 20331-5000; NAM, NAV, NPG—Armed Forces Day Test, 4401 Massachusetts Ave., Washington DC 20390-5290; WAR—Armed Forces Day Test, Commander, USAISC, Attn: AS-OPS-CM, Ft. Huachuca AZ 85613-5000.

ARMED FORCES DAY—W4ODR

MAY 18

The 36th Armed Forces Day will be celebrated on Saturday, May 18, 1985, from 1400 to 2200 UTC. ARS W4ODR, located at Naval Air Station Memphis, Millington TN, will be operated by active-duty, reserve, and retired sailors and Marines. Plans call for SSB operation on 7.230, 14.280, and 21.370 MHz (± 10 kHz). CW frequencies will be 21.145 and 28.145 MHz. 2-meter operation will be on 146.52 simplex. A special red, white, and blue certificate will be available to anyone who works W4ODR. No SASE is required. Calls not in the *Callbook* should QSL to: Military Club Station W4ODR, PO Box 54278, Naval Air Station Memphis, Millington TN 38054.

ANDERSON SC

MAY 18-19

The Lake Hartwell Hamfest will be held on May 18-19, 1985, at the Lake Hartwell Group Camp, on Highway 29, south of Anderson SC. Admission, camping, and flea-market spaces are all free. Campsites with hookups are available at nearby State Parks. The South's most relaxed hamfest will feature camping, fishing and boating on beautiful Lake Hartwell, bingo, a horseshoe tournament, and other activities for the whole family. The campground will open at 5:00 pm Friday and hamfest activities will begin at 9:00 am on Saturday. Talk-in on 146.79 and 147.33. For further information, contact Carl Davis KY4T, 203 College Avenue, Hartwell GA 30643; (404)-376-3606.

LIMA OIL CENTENNIAL

MAY 18-19

The amateurs of Lima and Allen County OH will operate special-event stations on May 18-19, 1985, to commemorate the discovery of oil in Lima. Participating stations will sign /OIL and will operate in the Novice, Technician, and General portions of the bands. To receive a certificate, send an SASE to the Northwest Ohio ARC, PO Box 211, Lima OH 45801.

PENN WIRELESS ASSOCIATION

MAY 18-19

The Penn Wireless Association, Inc., will operate special-event station W3SK from 1400 UTC on May 18, 1985, to 0200 UTC on May 19, 1985, to commemorate its 20th anniversary. Intermittent operation will be conducted during the week preceding these dates. Frequencies are: phone—3.98, 7.28, 14.28, 21.38, 28.58, and 146.52 FM, and 144.12 SSB; CW—3.54, 3.745, 7.04, 7.145, 14.04, 21.04, 21.195, 28.04, and 28.195. To receive a certificate, send a 9 × 12 SASE to PO Box 734, Langhorne PA 19047.

HARTWELL GA

MAY 18-19

The Anderson, Hartwell, and Toccoa Amateur Radio Clubs will sponsor the sixth annual Lake Hartwell Hamfest on May 18-19, 1985, at the Lake Hartwell Group Camp, on Highway 29, four miles north of Hartwell GA. Admission, flea-market space, and camping are all free. Activities include a left-footed CW contest, horseshoes, bingo, fishing, swimming, and other family activities. The campgrounds open at 6:00 pm on Friday. Talk-in on 146.19/.79, 147.93/.33, and 146.895/.295. For further information, contact Ray Pettit WB4ZLG, Route 1, Dooley Drive, Toccoa GA 30577.

WABASH IN

MAY 19

The Wabash County ARC will sponsor the 17th annual Wabash Hamfest on May 19, 1985, from 6:00 am to 4:00 pm, at the Wabash County 4-H Fairgrounds, State Road 13, Wabash IN. Admission is $2.75 in advance and $3.25 at the gate. There will be free overnight parking at the fairgrounds. Food will be available. Talk-in on 147.63/.03, 146.52, and 146.94. For information or advance tickets, send an SASE to Don Spangler, 235 Southwood Drive, Wabash IN 46992; (219)-563-5564.

VE1 ABEGWEIT AWARD

MAY 19

The Prince Edward Island Amateur Radio Association is offering the VE1 Abegweit Award to amateurs contacting PEI stations. Abegweit is the earliest name for Prince Edward Island and is a Micmac Indian name meaning "cradled on the waves." To earn the award, VE1 and VO1 stations must confirm contacts in all three PEI counties (Prince, Queens, and Kings). All other VEs and US amateurs must confirm contacts with any three PEI stations, regardless of county. DX amateurs must confirm contacts with any two PEI stations, regardless of county. Contacts after January 1, 1960, are valid for the award. On May 19, 1985, from 1200 UTC to 2400 UTC, the PEIARA will provide an opportunity for amateurs to work PEI stations. The frequencies are: CW—21.100, 14.050, 7.100, 3.700; SSB—21.300, 14.250, 7.200, 3.800. Frequencies may change due to band conditions, and the PEIARA will not be on all bands at the same time. Send a copy of your log (certified by two other amateurs) and $2.00 or 10 IRCs to PO Box 1232, Charlottetown, Prince Edward Island, Canada C1A 7M8. For more information about the award or the May 19th operation, contact David A. Smith VE1CIK, Box 529, Kensington, Prince Edward Island, Canada C0B 1M0, or call (902)-836-4246 after 2200 UTC.

STIRLING NJ

MAY 19

The Tri-County Radio Association will hold a hamfest on May 19, 1985, from 9:00 am to 4:00 pm, at the Passaic Valley Community Center, off Valley Road, Stirling NJ. Admission is $2.50 and tables are $10.00. Tailgating is by reservation only. Refreshments and free parking will be available. For more information or for reservations, contact Dick Franklin W2EUF, PO Box 182, Westfield NJ 07090; (201)-232-5955 or (201)-270-3193.

KNOXVILLE IL

MAY 19

The Knox County Amateur Radio Club, Inc., will sponsor a hamfest on May 19, 1985, rain or shine, at the Knox County Fairgrounds, Knoxville IL (turn right at Exit 51 off of I-74). Tickets are $2.00 in advance and $3.00 at the gate. Camping is available. Food will be provided by the Knox County Pork Producers Association (pork chops and pork burgers). For more information, contact Keith Watson, 119 South Cherry Street, Galesburg IL 61401.

WRIGHTSTOWN PA

MAY 19

The Warminster Amateur Radio Club will sponsor a hamfest on May 19, 1985, beginning at 7:00 am, at the Middletown Grange Fairgrounds, Penns Park Road, Wrightstown PA (about 15 miles north of Philadelphia). Admission is $3.00, with XYLs and children admitted free. Indoor spaces are $5.00 (includes 8-foot table and power) and outdoor tailgate spaces are $5.00. Vendor setup begins at 6:00 am. Refreshments will be available. Talk-in on 147.69/.09 and 147.52. For more information, contact Bill Cusick W3GJC, Apt. 706, Garner House, Hatboro PA 19040; (215)-441-8048.

PITTSBURG KS

MAY 19

The Pittsburg Repeater Organization will hold its annual hamfest on May 19, 1985, from 10:00 am to 5:00 pm, in Lincoln Park, Pittsburg KS. Admission is $5.00 per ham (includes chicken and pop for the family). Features include a flea market, license examinations, and a covered-dish dinner (please bring a covered dish). For more information, table reservations, or to notify the PRO of your intent to take an exam, contact Steve Cooper, PRO Hamfest, PO Box 1303, Pittsburg KS 66762.

OAK HARBOR OH

MAY 19

The Sandusky Valley ARC will sponsor a combined Sandusky County and Ottawa County hamfest on May 19, 1985, at the Ottawa County Fairgrounds, State Route 163, 3 miles east of Oak Harbor OH. Admission is $2.50 in advance and $3.00 at the door. Tailgating spaces, tables, and free parking will be available. Talk-in on 147.675/.075 and .52. For more information, contact Raymond Kruse K8IDA, 18980 West S.R. 51, Elmore OH 43416.

DALTON MA

MAY 19

The Northern Berkshire Amateur Radio Club will sponsor a hamfest on Sunday, May 19, 1985, beginning at dawn, at the Dalton American Legion, Route 9, Dalton MA. Admission is $1.00, with XYLs, YLs and children admitted free. A few tables will be available at no charge on a first-come, first-served basis. Food will be available. Free overnight camping will be permitted on Saturday night (May 18) beginning at 6:00 pm. Talk-in on 146.91.

ATHENS OH

MAY 19

The Athens County Amateur Radio Association will hold its sixth annual hamfest on Sunday, May 19, 1985, from 8:00 am to 3:00 pm, at the City Recreation Center, East State Street, Athens OH. Admission is $3.00. Spaces in the paved flea-market area can be claimed by tailgaters and people with their own tables on the day of the event. Indoor space is available only by advanced registration. Talk-in on 146.34/.94. For inside space reservations, contact Joe Follrod NE8R, 15 Roy Avenue, The Plains OH 45780; (614)-797-4874. For more information, write to Carl J. Denbow KA8JXG, Chairman, ACARA Hamfest Committee, 63 Morris Avenue, Athens OH 45701.

PARAMUS NJ

MAY 19

The Bergen ARA will hold a ham Swap 'n' Sell on Sunday, May 19, 1985, from 8:00 am to 4:00 pm, at Bergen Community College, 400 Paramus Road, Paramus NJ. There will be tailgating only—bring your own table. Admission is free ($4.00 for sellers). Amateur license exams will be given. Talk-in on .79/.19 and .52. For more information, contact Pete Adely K2MHP, 13-30 Edwards Street, Fairlawn NJ 07410; (201)-796-6622 nights.

TRACY, QUEBEC

MAY 26

The Quebec Provincial Hamfest will be held on Sunday, May 26, 1985, beginning at 9:00 am, at the Tracy Curling Club. Admission is $4.00, and 8-foot tables are $5.00 (outdoor) and $6.00 (indoor). Tables must be reserved by May 20. Setup begins at 8:00 am. For more information, contact the Sorel-Tracy ARC, PO Box 533, Sorel, Quebec, Canada J3P 2L5.

WEST FRIENDSHIP MD

MAY 26

The Maryland FM Association will hold its annual hamfest on Sunday, May 26, 1985, from 8:00 am to 4:00 pm, at the Howard County Fairgrounds, West Friendship MD (about 30 miles west of Baltimore on I-70). Admission is $3.00. Tables are $6.00 in advance and $10.00 the day of the hamfest (if available). Talk-in on 146.16/.76, 222.16/223.76, and 449.1/444.1. For more information or for table reservations, contact Craig Rockenbauch WA3TID, 429 Severnside Drive, Severna Park MD 21146; (301)-987-6042 (6:00-10:00 pm).

BLACKSBURG VA

MAY 30—JUN 1

Virginia Polytechnic Institute and State

University will hold a workshop, Personal Computer and STD Computer Interfacing for Scientific Instrument Automation, on May 30–June 1, 1985, at Virginia Tech, Blacksburg VA. The hands-on workshop, directed by Mr. David E. Larsen and Dr. Paul E. Field, is $450.00 for three days. Participants will be wiring and testing interfaces. For more information, write Dr. Linda Leffel, CEC, Virginia Tech, Blacksburg VA 24061, or phone (703)-961-4848.

SEASIDE OR
MAY 31–JUN 2

The North Coast Repeater Association and the Oregon Tualatin Valley ARC will sponsor the fifth annual Oregon State Ham Convention from May 31, 1985, through June 2, 1985, at the Seaside Convention Center, Seaside OR. The convention hall hours will be: Friday, May 31—5:00 pm to 8:00 pm; Saturday, June 1—8:00 am to 5:00 pm; Sunday, June 2—9:00 am to about 2:00 pm. The convention will feature commercial/dealer exhibits, seminars, VE testing, a flea market, and a banquet. For more information, contact OTVARC, PO Box 5132, Beaverton OR 97006.

GRAND RAPIDS MI
JUN 1

The Independent Repeater Association of Grand Rapids will hold its annual Hamfestival on June 1, 1985, from 8:00 am to 4:00 pm, at the Wyoming National Guard Armory on 44th Street, west of US-131. Admission is $3.50. Programs include satellite operation, packet radio, a CW copying contest, a shack picture contest, entertainment films for non-hams, and more. There will be a 15,000-square-foot indoor swap area and table space is free for all sellers. Dealer setup begins at 6:00 am. Talk-in on .165/.765. For more information or for table reservations, call Paul Gardner WD8IZB at (616)-538-8241 or write to IRA, 562 92nd Street SE, Byron Center MI 49315.

ST. PAUL MN
JUN 1

The North Area Repeater Association will sponsor a swapfest and exposition for amateur-radio operators on Saturday, June 1, 1985, at the Minnesota State Fairgrounds, St. Paul MN. Admission is $4.00 in advance and $5.00 at the door. Exhibits, commercial dealers, VE exams, and a giant outdoor flea market will be featured. There will be free overnight parking for self-contained campers on May 31. Talk-in on .25/.85 and .16/.76. For more information or for advance tickets, write to Amateur Fair, PO Box 857, Hopkins MN 55343; (612)-566-4000.

NH/VT NEIGHBORS DAY
JUN 1

Special-event station W1GUA will be operated from Fort Number 4 in Charlestown NH on June 1, 1985, from 10:00 am to 5:00 pm, to mark New Hampshire/Vermont Neighbors Day. The multi-operator station will be operating 25 kHz up from the bottom of the General portion of the 80-, 40-, and 15-meter CW and phone bands, as well as 2-meter simplex and packet radio. For a commemorative QSL, send a business-size SASE and QSL to Rudy Adler W1GUA, Dodge Hollow Road, Lempster NH 03605, or to WB1GXM, PO Box 428, Claremont NH 03743.

MIDLAND MI
JUN 1

The Central Michigan Amateur Repeater Association will sponsor the 11th annual Midland Hamfest on Saturday, June 1, 1985, from 8:00 am to 2:00 pm, at the Midland Civic Arena, Midland MI. Admission is $3.00 in advance and $4.00 at the door. Tables are $6.00 for a full table, $3.00 for a half table, and trunk sales are $3.00. Setup begins at 6:00 am. Free parking and handicapped parking will be available. VE license exams will be given. Refreshments will be available. Talk-in on 147.60/.00 and 146.52. For advance tickets or more information, contact Raleigh L. Wert W8QOI, 309 E. Gordonville Road, Route 12, Midland MI 48640; (517)-631-5591.

OHIO WINE MONTH
JUN 1–2

The Wireless Institute of Northern Ohio (WINO) will commemorate Ohio Wine Month by operating special-event station KO8O on Saturday, June 1, 1985, from 7:00 pm to 11:00 pm, on 3860 and 7235 kHz, and on Sunday, June 2, 1985, from 11:00 am to 3:00 pm, on 7235 and 14,235 kHz. The station will be located at a winery in Madison OH. For an 8½ × 11 certificate, send a legal-size SASE to: KO8O—WINO Weekend, 7126 Andover Drive, Mentor OH 44060.

HARRY'S HEYDAYS
JUN 1–2

The Southside Amateur Radio Club will operate special-event station N0EWP on June 1–2, 1985 (Harry's Heydays), in honor of President Harry S. Truman's 101st birthday, from near the old Truman farm home in Grandview MO. The station will be on 7235 and 14235 (±QRM). The times of operation will be: June 1, 1700–2400 UTC; June 2, 0001–0400 UTC and 1700–2200 UTC. A commemorative certificate will be available for a 9 × 12 SASE and 33 cents postage. QSL to: Southside Amateur Radio Club, PO Box 412, Grandview MO 64030.

COLUMBUS OH
JUN 2

The Battelle ARC will sponsor the fifth annual Ohio Hamfest on Sunday, June 2, 1985, from 8:00 am to 3:00 pm, at the Ganyard building on the Franklin County Fairgrounds, Columbus OH. Admission is $2.00 in advance and $3.00 at the door. Tables are $3.00 in advance and $4.00 at the door. Talk-in on 146.37/.97. For advance sales, send an SASE to Bill Welch W8LLU, 396 Brevoort Rd., Columbus OH 43214. For more information, call Bill W8LLU at (614)-261-7053 or Kevin WA8OHI at (614)-766-5313.

PITTSBURGH PA
JUN 2

The 31st annual Breeze Shooters Hamfest will be held on Sunday, June 2, 1985, from 9:00 am to 5:00 pm, at the White Swan Amusement Park, PA Route 60 (Parkway West), near the Greater Pittsburgh International Airport. There will be a flea market and family amusement park. Sheltered tables are available by advance registration. Talk-in on 146.28/.88 or 29.000. For further information, contact John Colbert K3SDL, 1831 Highland Avenue, Irwin PA 15642; (412)-863-5167 evenings.

HUMBOLDT TN
JUN 2

The Humboldt Amateur Radio Club will sponsor its annual hamfest on June 2, 1985, from 8:00 am to 4:00 pm, at Bailey Park, 22nd Avenue, Humboldt TN. Admission is $2.00. Features include a flea market, food, parking for RVs (electricity provided, water close by), and alternate activities. Talk-in on .37/.97. For more information, contact Ed Holmes W4IGW, 501 N. 18th Avenue, Humboldt TN 38343.

CHELSEA MI
JUN 2

The Chelsea Swap and Shop will be held on Sunday, June 2, 1985, from 8:00 am to 2:00 pm, at the Chelsea Fairground, Chelsea MI. Admission is $2.50 in advance and $3.00 at the door. Children under 12 and non-ham spouses will be admitted free. Setup begins at 5:00 am. Talk-in on 146.520 simplex and 147.255 (Chelsea Repeater). For more information or advance tickets, contact William Altenberndt, 3132 Timberline, Jackson MI 49201.

PRINCETON IL
JUN 2

The Starved Rock Radio Club will sponsor a hamfest on June 2, 1985, in Princeton IL. Admission is $2.50 in advance (before May 20) and $3.00 at the door. VE exams will be given and no pre-registration is required. For exam details, send a long SASE to Denny R. Chestney KM9L, 1212 Dogwood, Bloomington IL 61701. For complete hamfest information, contact W9MKS, RFD #1, Box 171, Oglesby IL 61348; (815)-667-4614.

BOWLING GREEN KY
JUN 8

The Kentucky Colonels ARC will hold its annual hamfest on June 8, 1985, beginning at 8:00 am, at the Jaycee Pavilion (inside a/c) on the So. Kentucky Fairgrounds, off US 231 North, Bowling Green KY. Admission is $2.00 and tables are $2.00. Outside setup is free. Refreshments will be available. Talk-in on 146.85/.25. For more information, contact Ed Gann N4HID, 445 Elrod Road, Bowling Green KY 42101; (502)-843-8911.

WIA 75TH ANNIVERSARY

The Wireless Institute of Australia, the world's first radio society, will celebrate its 75th anniversary during 1985. The WIA 75 Award will be available during the period from March 1, 1985, to December 31, 1985. To qualify, amateurs (and SWLs) need to contact (log) 75 members of the WIA. A contact will be valid only if the WIA member's individual membership number is logged. No more than 30 WIA members may be logged in any one callsign area. Send a log extract of the 75 members contacted and $2.00 (Australian) to WIA 75 Award Manager, Wireless Institute of Australia, 412 Brunswick Street, Fitzroy 3065, Victoria, Australia.

SATELLITES

USING THE AO-10 APOGEE PREDICTIONS

Apogee predictions for the month of May are provided for three sections of the United States: Washington DC at 39N 77W, Kansas at 39N 95W, and California at 38N 122W. Times are in UTC and apogee in this case is mean anomaly 128 rounded to the nearest whole hour. Use the chart as a guide in aiming your antenna, then fine-tune the azimuth and elevation values to peak the satellite's beacon signal. If you require more accurate orbital predictions, contact AMSAT at PO Box 27, Washington DC 20044.

AMSAT-OSCAR 10 APOGEE PREDICTIONS
MAY 1985

			WASH		KANSAS		CALIF	
ORBIT	DAY	TIME	AZ	EL	AZ	EL	AZ	EL
1746	1	1500	231	26	212	36	173	43
1748	2	1500	224	27	204	35	166	38
1750	3	1400	212	34	189	39	151	36
1752	4	1300	198	39	172	41	136	31
1754	5	1300	190	37	165	37	133	26
1756	6	1200	174	39	150	34	122	19
1758	7	1100	158	38	137	30	112	12
1760	8	1000	143	34	125	23	104	4
1762	9	1000	139	29	122	18		
1764	10	0900	127	23	113	10		
1766	11	0800	117	16	104	3		
1768	12	0800	115	10				
1769	12	1900					252	7
1770	13	0700	106	3				
1771	13	1900					247	9
1773	14	1800					239	18
1775	15	1700			251	7	230	27
1777	16	1700			245	9	222	27
1779	17	1600	251	5	237	18	210	34
1781	18	1500	243	14	228	26	196	39
1783	19	1500	237	15	221	26	188	37
1785	20	1400	228	24	209	33	172	39
1787	21	1300	217	31	194	38	156	37
1789	22	1200	204	37	178	40	142	33
1791	23	1200	196	36	171	37	138	28
1793	24	1100	181	38	156	35	126	22
1795	25	1000	164	38	142	31	116	15
1797	26	1000	159	34	138	26	115	9
1799	27	0900	144	31	126	20	106	1
1801	28	0800	132	25	116	13		
1803	29	0800	129	20	115	7		
1805	30	0700	119	13	106	0		
1807	31	0600	110	5				
1808	31	1800					249	5

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

I know it might seem hard to believe, at least it is for me, but this month marks the end of the eighth year of "RTTY Loop." We have covered a lot of ground on these pages, and if all is well, we will cover more in the years to come. But before I get too deeply into this month's offering, I just want to thank all of you for your support through these years. Without that it would not have been possible.

Well, plunging right in, I have a letter here from Charles E. Heisler K3VDB of Red Lion PA. Charles has been using one of the commercial RTTY adapters for a small computer and is looking for a simple circuit to put in front of it to improve the signal capture.

You might try the circuit shown in Fig. 1, which is adapted from the input section of the prize-winning RTTY tuning indicator by John Langner WB2OSZ, which was published in the March, 1983, issue of *73*. I have looked at several input filters that use passive coils, active filters, and phase-locked loops, and among all of them I tend to lean toward the phase-locked loop for applications such as this. Audio is coupled via the 0.1-uF capacitor, and back-to-back diodes function as a simple limiter. The 5k potentiometer is adjusted to provide the best capture of the signal, and the output should be a clean square wave that follows the original input frequency.

By the way, the regulated 6.2 volts shown in the diagram can be derived from a 12-volt source, both positive and negative, coupled through a 220-Ohm series resistor and a 1N4735A zener diode to ground, oriented for polarity. These elements were omitted from the diagram for simplicity's sake on the computer-generated schematic.

Speaking of computers, last month I mentioned a new group of computer accessories here at WA3AJR. This month, I would like to tell you about one of particular interest to the RTTY crowd. One of the biggest problems in writing RTTY software for the CoCo® is the "bit-banger" serial port. This is really one bit of a PIA, or parallel port, being addressed through a time-wasting loop so that it can put out one bit at a time. While this is flexible, we did a similar thing in a RTTY program written eight years ago; it does prevent the CPU from doing much else besides input and output. Enter the PBJ 2SP-PAK.

Containing a 6551 ACIA, this cartridge plugs into either the ROM socket or a CoCo expansion bus, such as the Tandy Multi-Pack or the PBJ C-C Bus (described last month), and provides two true serial ports. These ports are independently addressable under Basic, OS9, or any other program set up to address them and may be configured for baud rates of 50 to 19,200! Word length can be five—that's right, five—six, seven, or eight data bits, with all common parities. Not only that, but setting the word length to five bits enables a stop-bit setting of one and one-half stop bits. Now this would be about ten percent faster than "standard" Murray at 45.45 baud, but it may be worth a look. If you felt like potchkying, you could even put in your own clock to run at a nonstandard baud rate like 45.45!

When used with an expansion bus like the PBJ C-C Bus, the ports may be configured to generate interrupts, making the design of a sophisticated terminal program that much easier. It looks very hard to beat, and it adds another valuable dimension to the CoCo owner's station. For information, be sure to contact PBJ at PO Box 813, N. Bergen NJ 07047. Direct your inquiry to Al Alberto and tell him you want to know about the CoCo accessories described in "RTTY Loop."

You all have been a vocal lot when it comes to your preferences and the like with various computers on RTTY. This month it's the CoCo's turn. OK, owners of TRS-80 Color Computers, let me know what you are doing. What kind of software are you running on RTTY, how do you like it, and what else would you like to see? Put your information on a postcard or short note and send it to me at the above address.

For those of you who came in late, I am compiling this information for most of the popular computers, and when I have it all together it will be published here. Given the lead time of this column, I would expect that it will be early fall when I will give you all the final tally. Watch for it!

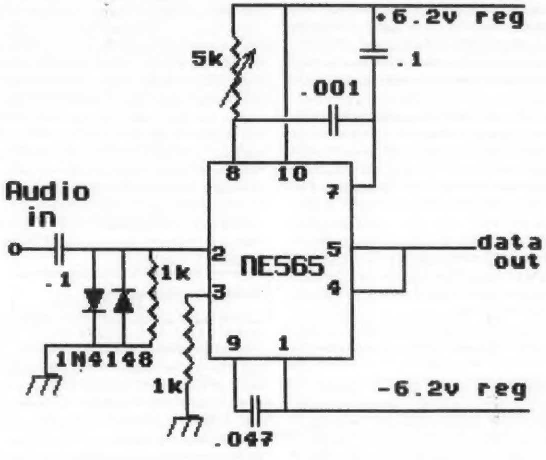


Fig. 1.

Controversy, controversy, I love controversy! Here's a little, generated by a letter from Henry Ross of Newton MA. Henry wrote to Heathkit when he noticed that their new HD-3006 RTTY Crossfire Tuning Indicator had its mark and space indicators reversed from what he had always assumed was a "standard" arrangement. To wit, the Heathkit unit displays a "cross" type of tuning pattern, with the mark signal as the vertical bar and the space as the horizontal. Henry states that he had always seen the mark as horizontal and space as vertical, and asks for a judgment.

Well, I consulted several references, since I was unaware of a standard myself. You know what? A RTTY handbook published twenty years ago does show the mark as the horizontal bar and the space as vertical, but another RTTY handbook from about ten years ago shows just the reverse, just like the Heathkit. So, sorry to fudge, but I guess you pay your money and take your choice. Whatever you grew up with, that's what is right. Sort of like cinnamon and sugar versus syrup on your french toast, I guess.

I am continuing to put together extracts, updates, and compilations of old columns. With eight years to draw from, I do have a lot of material to draw from. A list of what is currently available can be yours for an SASE mailed to the above address. Because of the lead time of this column, it would be foolish of me to try to list them all out here. Who knows, I might even get a burst of energy, or find some previously forgotten chunk of time, and churn a few more out. Anyway, let me hear from you if you are interested.

You know, every month I end the column with a note about dropping me a line on this or that, with an admonition to be sure to enclose an SASE if you would like a reply. Well, I know that postage is going up, and we're supposed to be on the way to becoming a paperless society, so if you like, you may send me E-Mail on Compuserve, and I will try to answer you when I get the message. Address it to me, with user number 75036,2501. And enjoy a little chuckle as my telephone bill climbs!

W2NSD/1
NEVER SAY DIE

editorial by Wayne Green

from page 4

hearing a weak station calling CQ in the DX part of the band. It was a W5 something portable. I felt foolish calling a station where I didn't know the call, so I made it short. He came right back, gaining in strength. I began to get more of the call—W5I...W5IMW portable...W5IMW portable C7 in Tiensin, China!

He was running ten Watts to a very long wire and I was the only station on the band. We talked for about fifteen minutes and then he said I was fading and other signals were coming through. An hour later he was calling me again—everyone else had faded out and I was still going strong.

That pattern repeated itself over and over. Often S9+ DX ops just couldn't hear me. If I'd get up a half hour earlier in the morning, they'd come right back with wonder at my signal into the south Pacific.

Alas, after I got out of college I got into broadcasting and lived in rooming houses and never had any space for Twin-Threes. Oh, I had a rig with me, but the best I could do was a twinlead dipole thrown into a nearby tree.

Not to write a discouraging word, but I think if you go to the trouble to build a Twin-Three antenna, you'll find it is useless except at the height of the sunspot cycle. Its angle of radiation is just too low to do anything these days.

The Twin-Three was invented by John Kraus W8JK, of course. It appeared in *CQ* in 1945. I published it again in the late 50s in *CQ*. I've probably published it in *73*, but it's long enough ago that I've lost track. Jones used to have it in his *Radio Handbook*. Don't worry, when the sunspots come back I'll give you the dimensions. I remember 'em.

You know, I've often wished I had a location where I could hang a 75m Twin-Three antenna. What a signal that might put out! Of course, you would have to find 40-foot-long support braces for the ends. It might take a four-by-four for that. What a beaut for a sweepstakes contest. That might work even in the low sunspot number times.

DX

Chod Harris VP2ML
Box 4881
Santa Rosa CA 95402

AMATEUR RADIO IN THE USSR

Politicians in the United States have deep-seated and important differences in opinion with their counterparts in the Union of Soviet Socialist Republics (USSR). From the relative importance of the individual versus the state, to what the other side claims is a conspiracy for world domination, it is hard to imagine two well-developed countries with so little common philosophical ground. However, the Russians have found that the many benefits of a domestic amateur radio service far outweigh the inherent conflict between the freedom of the individual and the power of the state.

Specifically, amateur radio provides a cadre of self-trained electronics and communications technicians at little or no cost to the state. Russian hams also provide some measure of international goodwill to their fatherland, another common ground with their sworn capitalist enemies.

But the Russians take a very different view of ham radio than do United States lawmakers. The concept of individual enterprise and initiative is discouraged in the USSR, in favor of benefits to the state. Somehow the Central Radio Club, administrator of RadioSport in the USSR, has managed to balance the apparently conflicting forces of central control and the uncontrollable, individual nature of amateur radio, to provide a healthy amateur radio service in their far-flung country.

In an effort to increase understanding between our two peoples, let's look at the amateur radio service in the USSR, and then perhaps share some of our amateur-radio experiences with our fellow hams behind the Iron Curtain.

Getting an amateur-radio license in Russia takes more planning and preparation than getting a US Novice license. The basic license application asks for considerably more information than that requested on the FCC Form 610. Statements about whether the applicant has ever traveled outside the USSR, details of any criminal convictions, and information about military service are only part of the application. A complete autobiography is another requirement, especially including details as to parents' nationalities, working habits, and whether or not the applicant or any close relative is a communist party member. A letter of reference from one's boss at work (or instructor at school) must also be included. Young (14-16 years old) aspiring hams need parental permission to apply for a ham license, with the parents affirming their responsibility for their children's actions. (My father never would have signed such a statement.) The applicant also must provide four photographs, a copy of his or her residence registration, and the schematic of the proposed receiver. That's right, a schematic of the radio. There aren't any Radio Shacks or amateur-radio stores in the USSR, and all amateurs are expected to build all their own gear from scratch. (It doesn't work out this way in practice, as some of the more technically inclined hams do much or all of the actual construction for some of the more on-the-air oriented amateurs, but the Central Radio Club does assume a much higher level of technical expertise than the FCC does.)

Once the application has been reviewed and approved, the amateur is allowed to begin—to receive only!

All this is required merely to get a Shortwave Listener's license. The SWL gets a "callsign" based on the republic of residence and the local radio club and starts to accumulate QSL cards. Every active DXer has received a handful of SWL cards from Russian and Eastern European would-be hams. And many stateside amateurs simply file them in the circular file. But these cards mean a great deal to the sender.

In order to move up to an operator's license, the budding ham has to SWL for a period of at least 6 months, and probably longer. He (or she) must accumulate about 500 QSL cards. Considering the terrible return rate of SWL reports, this is quite a chore. Fortunately, fellow Eastern Bloc amateurs survived that same requirement and are usually more responsive to the SWL request than stateside hams, who all too frequently treat SWL cards as a nuisance. For hams in several countries, however, these cards are an important stepping stone toward a full amateur license. Consider that before you toss that handful of Russian SWL cards in the trash.

Once our would-be amateur has amassed the appropriate number of QSL cards, he or she takes an oral examination and, if successful, gets a beginner's callsign. The new amateur has transmitting privileges on 80, 40, 15, and 10 meters, but at a power level of only about 25 Watts. Note that the Russian Novice does not have access to 20 meters, a restriction shared by stateside Novices. On the other hand, no knowledge of code is required for the entry-level license.

So now our new Russian amateur races to his or her own shack and starts sending "CQ DX?" Not quite yet. As in the US, the amateur needs both an operator's license *and* a station license to get on the air from an individual location (QTH). In the US, the two parts of the amateur license are on the same piece of paper, and the application for both is Form 610. The Russian amateur actually requires two permits to send: one to build the transmitter (remember: no Yaesus or Kenwoods in the USSR) and yet another permit to operate the transmitter! Both of these station permits must be renewed on an annual basis.

For those amateurs who cannot meet these requirements, or who cannot afford the cost of the transmitter or component parts, the local radio club probably has a club station.

Even with an individual station license in hand, our new Russian amateur is not yet prepared to talk to stateside amateurs. Working amateurs in capitalist countries such as the United States requires yet another permit. In addition to the formal application, the amateur wishing to expand his or her DX horizons to include capitalist hams needs to submit a copy of the station logbook, a list of contest activities, and confirmation of "social work," services rendered on behalf of the state.

Our budding amateur might also wish to upgrade the Novice license to a higher class. The next higher license class includes CW privileges on 20 meters, as well as on the other HF bands, but it does not include 20-meter phone privileges. The power limit is also higher: 75 Watts. The majority of Russian amateurs hold this class of license.

Certain amateurs hold the highest class Russian amateur license, which carries full privileges on all bands, all modes, with a 250-Watt power limit. (Some of the club stations approach this power limit the way too many stateside hams do—as a lower limit! Some Russian transmitters have 250-Watt driver stages, feeding final amplifiers which would make even a California Kilowatter green with envy.) Required qualifications include 2000 QSOs, activity in six contests in the past two years, 20-wpm code receiving and 18 sending (without error), and 8 amateur-radio awards earned. Obtaining this highest class of Russian license seems to require more than amateur-radio expertise. Good political connections or active social work appears to be a prerequisite for the unlimited class.

Whatever the class of license, the callsign of the Russian ham reveals valuable QTH information. Unlike the United States, where the number of the callsign is rapidly losing all significance, the callsigns in Russia are issued in a very orderly fashion and indicate the specific oblast (local political unit) of the operator. The first letter of all regular Russian callsigns is R or U. The E-block of callsigns is allocated to the USSR but is restricted to special-event callsigns. The second letter of the Russian callsign always indicates the republic of the operator. There are 15 separate republics in the Union of Soviet Socialist Republics, each with its own identifying second letter. For the most part these letters follow the prefixes used before the May, 1984, callsign reform in the USSR and can be found in any list of amateur countries. The callsign also differentiates club callsigns from those of individuals. And unlike stateside stations, a Russian ham gets a new callsign if he moves to a different oblast. (See the May, 1984, "DX" column for more details on the Russian callsign reform.)

Working the Russian Station

One of the major differences between amateur radio in the USSR and in the United States concerns freedom of speech. In this country there are essentially no restrictions on topics which can be discussed over the amateur airways. In fact, even amateurs who repeatedly use foul and obscene language cannot be easily driven off the air, as certain California repeater operators have discovered. The only topics actually prohibited on the amateur bands are those subjects which are crimes outside the field of amateur radio. For example, you are not allowed to plot a robbery over the local repeater.

Behind the Iron Curtain, freedom of speech has a vastly different meaning. The Russian amateur rules specify which topics *may* be discussed over the air, rather than listing those which cannot be discussed. Russian hams must limit their QSOs to comments about their individual stations and topics directly related to amateur radio. Comments about politics, religion, and other sensitive subjects are expressly prohibited. Asking a Russian ham if QSL cards are censored gets a reply such as, "Weather here very cold." The previously-excellent English of the Russian ham seems to deteriorate rapidly when topics other than amateur radio are broached. It is important to keep this restriction in perspective: What is remarkable is that Russian amateurs may converse at all. That the topics of conversation are restricted seems more in keeping with the highly centralized state.

Once you have made contact with a Russian amateur, you'll probably be looking for a QSL card. If you query the Russian amateur about a confirmation, he will probably respond, "QSL sure via Box 88, Moscow." In keeping with the centralized nature of amateur radio in the USSR, all QSLs must pass through Box 88, the QSL address of the Central Radio Club, just outside the city limits of Moscow. If you send a card to a Russian amateur, it must go to Box 88, where it is sorted and forwarded to the appropriate local amateur-radio club for distribution. Any prohibited items would be removed or detached at this time: money (green stamps), IRCs, religious tracts, political statements, indecent cards, etc. The Russian amateur returns your QSL in the same manner: via Box 88.

As with many other aspects of what is considered to be a hobby in this country, the Russian authorities take QSLing very seriously. The amateur who receives a QSL card is obligated to return the courtesy. Failure to respond to QSL requests is cause for loss of license. Can you imagine a similar rule in the United States?

Even with this seemingly rigid rule, getting a QSL card for a contact with a Russian amateur can try the patience of any amateur. For example, during sunspot peaks (alas, not now!) many of the low-power Soviet amateurs work around the world with their limited gear. The higher-class licensees work correspondingly more stations, greatly increasing the QSL load on Box 88. As the number of QSL cards passing through Box 88 doubles and triples, the sorters and forwarders fall further and further behind. As the sunspots start to fall off, the QSL bureau managers begin to catch up with the backlog of a year or more. Three years was the typical wait for Russian QSLs after the last sunspot maximum, with some notable and welcome exceptions. 18 months to two years is close to the norm for Russian confirmations today, but you may find quite prompt service during these days of fewer sunspots, and fewer QSOs.

Even when the turnaround time through Box 88 is relatively rapid, another snag slows the return of your confirmation. Russian cards for stateside hams are neatly bundled into brick-sized packages which cost the least to ship, via surface transportation, of course. But unlike just about any other country, the Russian QSL sorters do not send the cards directly to the appropriate incoming QSL bureau in the States. Instead, cards for every call area are mixed together. These bundles have to be broken apart and sorted by hand into the appropriate divisions, to be forwarded to your local QSL bureau. This additional sorting step adds a month or two to the already-long process of getting a Russian QSL card. On the other hand, the Russians must go though the lengthy process of QSLing via Box 88 for *all* their DX contacts; you only have to put up with this cumbersome system for a small fraction of your QSOs.

The Central Radio Club has recently eased the restrictions on direct QSLing by Russian amateurs. The Russian ham can include a QSL in an addressed, stamped, but unsealed envelope, to Box 88. There the card will be checked for any unauthorized enclosure, sealed, and mailed. Some Russian amateurs have even QSLed directly with stateside amateurs, but the process carries its risks. More than one Russian ham has lost his license for just such activities. Unless you're an expert in Soviet-American relations, stick to the slow, but safe, method of QSLing via Box 88.

Radio Contests in the USSR

The Russians take their radio contests very seriously. The very name of the Russian amateur service, RadioSport, suggests the competitive nature of amateur radio in Russia. Soviet stations are very active in the All Asian Contest, the Radio-Sport in July (of course), and their own equivalent of a major DX test: the CQ-M contest in May of each year. CQ-M stands for CQ-Mir, which translates as CQ Peace. This 24-hour DX contest starts about 2100 UTC on the second Saturday in May (check contest listing in the amateur-radio press for this year's dates and times). Russian hams will send a signal report and oblast number, and you respond with signal report and serial number. Contacts with stations on another continent are worth three points, those with different countries in your continent are worth one. Contact your own country for multiplier credit only. Multipliers are countries worked per band. Entrants who send their logs to Box 88, Moscow, by July 1 will receive a badge signifying their participation in the contest. Russian entrants in the CQ-M contest are required to submit logs; failure to do so can result in loss of license. An interesting wrinkle to the contest: Only those multipliers backed up by logs are valid. If you work a bunch of rare countries, but they don't submit logs, your contacts do not count.

Contacts with Russian amateurs can also lead to some attractive awards. Russian "diplomas" or awards range from an easy Worked-All-Continents to some very difficult worked-all-oblasts awards. For more information on these awards, send a self-addressed, stamped envelope to *USSR TidBits*, Editor Tom Frenaye K1KI, Box 62, Unionville CT 06085. A subscription to *USSR Tidbits* is $6.00 for six issues. Thanks to Tom for much of the above information.

LETTERS

LIDS AND KIDS

Over the past months I have read several stories in different amateur-radio publications regarding the poor behavior some amateurs show on our bands. I have run into a few of these myself, but on February 11, 1985, I heard a QSO I will never forget.

I happened to be tuning the 75-meter phone band at about 3:00 pm EST when I came across two amateurs from the 1st call district conversing on 3780 kHz (they later moved up to 3810 kHz). For over an hour I listened to these two guys bad-mouth just about everyone from the government down to the paperboy. Foul language was the order of the day (I term any language not allowed on TV or radio as foul). Women were referred to as "broads" and just about everyone was an idiot, including a popular amateur-radio distributor in the Philadelphia area.

Of course, this QSO wasn't complete until it contained some racial slurs. But the climax came when they agreed that it was a shame that Reverend Jesse Jackson wasn't aboard his former campaign plane when it crashed. UNBELIEVABLE!

Where is the FCC when you really need them? It's no wonder that a certain other amateur would not answer their calls to join them. He knows how to select his friends! These two fellows called so many other people idiots when, in fact, what they needed was a mirror.

My point is this. How can we lure new blood into our ranks when people like this reflect such a poor image? All a newcomer has to do is tune to a QSO like this and he will think that amateur radio has less to offer than CB.

Finally, if we are to save our bands from commercial interests, we better show the FCC that we have a better need and use for our frequencies than these two lids did!

John R. Schell N3AB
New Tripoli PA

TOM TOMS

I love radio communication and I'm going to get my Novice license in a couple of weeks. I had to learn Morse code (why I don't know); I hate code and don't expect to use it.

I wonder why you like to keep the Morse code. As far as I'm concerned, the code is a thing of the past—it is the same thing that the Indians used to pass messages with on their tom toms. The code is out of time.

I know what you are going to say: If we got a license with no-code, the ham bands will be like the CB band. This is true.

Let me explain my beliefs. I'm not for a Novice license with voice privileges. Rather, I'm for a Novice test with tougher questions and no code requirement which grants you the privilege to use CW by computer.

One thing I would like to mention is that nobody seems to be concerned about the proliferation of Japanese products on the ham market. In my eyes, this is worse than the no-code license.

R. D'Amico
Dixon KY

Blessed if I know where you got the strange idea that I am now or ever have been an advocate of Morse code. I'm the one who has been fighting the whole idea the hardest.

There is no reason to believe that removing the code requirement is going to make our ham bands like CB. We still have a rather strong technical and rules exam, which should do the job. Japan has no-code and their ham bands are just fine.—Wayne.

CELLULAR DIVISION

You are no doubt aware of the recent proposal by General Electric to develop in the United States a "Personal Radio Service" (PRS) to provide ordinary citizens a workable alternative to the Citizens Radio Service and the vastly more expensive cellular radio-telephone. A similar, though surprisingly less versatile, system is already in operation in Japan and is evidently proving extremely popular.

As I understand GE's proposal, a type-accepted repeater with phone-patch capability would operate at a 900-MHz allocation, working with one or more mobile/portable units to provide radio-telephone capability. There being no proposed restriction on antenna height, one could erect as much aluminum in the air as the pocketbook (or zoning board!) would allow. The anticipated working radius would be in the neighborhood of 5–8 miles—fully sufficient for 80% of most individual needs. Frequency selection, signaling, and identification would be by digital means in a manner similar to cellular radio-telephone.

Predictably, this proposal has met strong opposition from corporate interests heavily vested in cellular radio-telephone that feel that PRS would threaten development of cellular radio. They state that once the cost of mobile hardware drops under $1,000 per unit, the market will "take off." This overlooks the cost of *using* cellular which, at present, is about $100 per month, far beyond the reach of most persons. PRS nicely fills this gap and could be a viable system with widespread acceptance *if* the cost can be kept in the neighborhood of $500 for both a home repeater and one mobile/portable unit. Absence of a monthly usage fee is another very favorable factor.

The whole situation says a lot about the corporate mind-set whereby new ideas are perceived as a threat rather than an opportunity. My personal feeling is that manufacturers should be considering how they might market such systems to make a healthy profit, as occurred in the heyday of both amateur radio and Citizens Radio. This would require them to rethink their role and recognize that they are in the business of selling *communications* rather than selling cellular-radio or CB *equipment*. The much-talked-about "under $1,000" cellular breakpoint is, in my opinion, not going to amount to much so long as the cost of use remains high, as it very likely will. Industry spokesmen who talk about cellular radio's broad acceptance and who are in decision-making positions simply do not have a realistic grasp of the fact that the average person must apportion carefully his/her limited funds. These corporate decision-makers are not "average citizens," don't earn average salaries, and, therefore, almost inevitably make the wrong determination as to how the ordinary citizen will act! But I am straying from the point.

I wrote to Senator Goldwater stating that corporate opposition might, in the interest of the citizenry in general, be circumvented by a grass-roots program coupled with *visible, active* support from within government. I hope that he may be able to generate some interest and support.

There is another aspect to this issue which may work in its favor. So far as I can determine, PRS would be an "American" system: developed, marketed, and (at least partially) manufactured by an old-line US firm, General Electric. It is time that a technologically up-to-date product was marketed by a US firm!

We hear much of the so-called US technological edge but, in fact, this is not all there is to the issue. While we seem able to develop new concepts, it is in the areas of manufacturing, marketing, and getting the practical result of those ideas in the hands of users that we fall woefully short. Many new products conceived on these shores have been put into service and have reached maturity in Japan and Europe while languishing in endless litigation in the United States.

This communications era should encompass all citizens, not just those with technical credentials, corporate backing, or large amounts of money! PRS addresses a genuine need and, I believe, would in no way dilute the growth of cellular radio or radio common-carrier services. It is time we had a workable alternative to the obsolescent, interference-plagued Citizens Radio Service. In my opinion, GE was wrong to withdraw its proposal in face of corporate opposition. Don't we believe in competitive free enterprise, or do we merely pay it lip service? It is up to farsighted, influential individuals and organizations to make this issue visible in a meaningful way to the public so that we can eventually adopt the service proven so successful in Japan.

Thomas L. Stewart K9LJQ
Champaign IL

DEAR JON

This is in reference to Jon Danford's (KA0SOV) comments under the heading "No Encouragement" that appeared in the March, 1985, issue of *73*.

I would like to state that the local ham club, with its seventy-plus membership, is a very diverse and talented group. It includes technicians, operators, antenna builders, experimenters, DXers, computer enthusiasts and, most important of all, the club is into emergency communications in a big way with its emergency-operations center operated in conjunction with the city civil-defense director. If it has to do with hamming, this club has it!

One must be approachable and step forward and seek out those in the club with his or her interests. It is there for the asking, and had Jon sought out help it would have been freely given. In fact, Doyle (W0SOM), who helped Jon, is a highly regarded member of the local club. If Jon had only discussed his feelings with the club president, his wishes would have been brought before the club. I can assure him he would then have received more help and encouragement than he could have used.

Our current president is a retired broadcast engineer and is a builder and experimenter. The local club abounds with hams who help, encourage, and support new hams and those who want to become hams in any way possible.

When election time rolls around again, I would encourage Jon to step forward with his new-found knowledge and ability and seek office. The club is always seeking new leaders. It is much easier to tear down a club than build it!

Jay C. Lowe KA0RKR
Joplin MO

(SIC)

After reading your "Never Say Die" and "Letters" colloms. I have found your magazine a complete insult to amateur radio. And will not buy or read your trash. Anyone who is for allowing no code test should be sent straght to 11 meters for life.

Then you go on to say at each renewal time, up the code requirement 5 wpm. (URS should be 20 untill fale)

Old indian say, white man you got fork tongue.

And by the way I am on the radio myself. And the code is a real dog wermier for me, but, it keeps the riff-raff out, and on 11 meters. You might fool the new hams but once they read for awhile they will catch on.

Hope to see you go broke

p.s. Bet you don't have the brass [*deleted*] to print this, do ya!!!!

J. Bowen KB6DXN

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

INDIANA MONTH OF MAY CONTEST
Starts: 0000 UTC May 1
Ends: 2400 UTC May 31

The objective is to be the first non-Indiana station to work 500 Indiana contacts, or the Indiana station reporting the most contacts. Stations may be worked once per band per mode. No crossmode, 30-meter, or repeater contacts are allowed. All entries must be single operator only.

This is a fun event designed to promote contacts between Indiana hams and the rest of the world. The contest is being sponsored by the Southern Indiana QRP Group to promote and encourage HF operation in Indiana.

EXCHANGE:

RS(T), name, and state, province, country, or IN county.

AWARDS:

Certificates to the top 33 non-IN and top 33 IN stations. Endorsements for all SSB, CW, QRP (5 Watts or less PEP), and others if warranted by entries received. Special certificate to any station working all 92 IN counties; any IN station achieving WAS, WAC, DXCC; and any Novice/Technician station reporting 33 or more CW contacts. Certificates will be awarded to the 33 non-IN stations reporting the most QSOs with IN stations if less than 33 entries reporting 500 contacts are received. Date and time (UTC) of last contact will be used to break ties.

ENTRIES:

Send copy of log, dupe sheet (200 or more QSOs), and score sheet. Business-size SASE for return mailing of results/certificates appreciated. Logs must be received by June 30. Official score sheet (optional) and IN county award checklist available for SASE. All logs and inquiries should be addressed to: Russ Ryle N9DHX, Southern Indiana QRP Group, PO Box 2466, Bloomington IN 47402.

FLORIDA QSO PARTY
1400 to 1900 UTC May 4
0001 to 0500 UTC May 5
1500 to 2300 UTC May 5

This is the 19th annual Florida QSO Party sponsored by *Florida Skip*. All amateur bands may be used, 160 through 2 meters. All stations will separate phone and CW logs; phone and CW are separate contests. A station may be worked once on each band on each mode. Neither crossband nor crossmode contacts will count for contest credit. Florida stations may work other Florida stations for contest points only. Out-of-state stations may not work each other for contest credit. Contacts made on repeaters do not count for credit.

Florida stations will be divided into two classes. Class-A stations are those operating portable or mobile on emergency power and running 100 Watts or less output inside Florida but outside of their home counties. Class-B stations are all other stations operating in Florida. Entrants may be single operator or multi-operator and this must be indicated on the summary sheet.

Each entrant agrees to be bound by the provisions of the contest announcement, the regulations of the applicable licensing authority, and the decisions of the *Florida Skip* Contest Committee, which are final.

EXCHANGE:

Florida stations send RS(T) and county of operation. Others send RS(T) and US state, Canadian province, or country.

FREQUENCIES:

Phone—3945, 7279, 14279, 21379, 28579, 50.2, 146.52. CW—3555, 7055, 14055, 21055, 28055.

SCORING:

Florida stations count one point per QSO with out-of-state or other Florida stations. Multiplier is the sum of states (49 max.), provinces (12 max.), and DX countries (27 max.) actually worked; maximum multiplier is 88. Others count 2 points per QSO with each Florida station. Multiplier is the number of different Florida counties worked (67 max.). Final score is the product of QSO points and the multiplier. Class-A stations *only*, multiply score by 1.5 to obtain final total.

AWARDS:

Certificates for phone and CW to the top single-operator contestant in each state, province, DX country, and each Florida county. Multi-operator winners will receive certificates as activity justifies. There are also 5 plaques to be awarded as follows: high single operator in Florida and out-of-state, CW and phone, and to the Florida club with the highest aggregate score. This year there is no minimum number of contacts to be eligible for a certificate.

ENTRIES:

Phone and CW entries are to be *separated!* Along with legible logs in chronological order, a summary sheet is required with each entry. The summary sheet must contain score, number of QSOs, multiplier, station callsign, entry class and number of Florida counties, power source for Class-A entries, county, state, province, country or region of operation, callsigns of all operators/loggers if multi-op, name of club if part of a club aggregate score, name and address typed or printed in block letters, and a signed declaration that all rules and regulations have been observed. All stations making more than 200 QSOs must also include a dupe sheet. Sample summary and log sheets are available for an SASE from the QTH below.

At the discretion of the contest committee, stations and/or operators may be disqualified for improper reporting, excessive dupes, errors in multiplier lists, unreadable logs, obvious cheating, etc. All entries must be received on or before June 3. Mail all entries to: *Florida Skip* Contest Committee, c/o North Florida Amateur Radio Society, PO Box 9673, Jacksonville FL 32208.

G-QRP-CLUB LATE SPRING QRP SSB ACTIVITY WEEKEND
0900 to 2300 UTC May 4 and 5

All radio amateurs interested in QRP are invited to take part in the club's activity. No special exchange information was mentioned in the information provided by the club. The operating schedule for each day is as follows: 0900–1100 UTC = 14285/21285/28885, 1100–1300 = 3690/7090, 1300–1700 = 14285/21285/28885, 1700–1900 = 3690/7090, 1900–2100 = 14285, 2100–2300 = 3690/7090.

Reports on the activity or requests for membership details should be sent to Fred Garratt G4HOM, 47 Tilshead Close, Druids Heath, Birmingham, B14 5LT, England.

In addition to special activity periods, members of the G-QRP-CLUB have a weekly activity period on Sundays between 1100 and 1230 and again from 1400 to 1530 on the international QRP frequencies, and on Wednesdays on 3560 CW from 2000 local time (UK and Western Europe).

MICHIGAN QSO PARTY
1800 UTC May 18
to 0300 UTC May 19
1100 UTC May 19
to 0200 UTC May 20

This year's QSO party will be sponsored by the Oak Park ARC. Phone and CW are combined into one contest. Michigan stations can work Michigan counties for multipliers. A station may be contacted once on each band/mode. Portable/mobiles may be counted as new contacts each time they change counties.

EXCHANGE:

RS(T), QSO number, QTH as state, country, or Michigan county.

FREQUENCIES:

Phone—1815, 3905, 7280, 14280, 21380, 28580. CW—1810, 3540, 3725, 7035, 7125, 14035, 21035, 21125, 28035, 28125. VHF—50.125, 145.025, 146.52.

SCORING:

Multipliers are counted only once. Michigan stations score 1 point per phone QSO, 2 points per CW QSO, and multiply QSO points by the total number of states, countries, and Michigan counties. KL7 and KH6 count as states; VE counts as a country. Maximum multiplier is 85.

Others, take QSO points times the total number of Michigan counties. QSO points are 1 point per phone QSO, 2 points per CW QSO, and 5 points for each club-station contact with W8MB. Maximum multiplier is 83.

VHF-only entries: same as above except multipliers per VHF band are added to-

CALENDAR

May 1–31	**Indiana Month of May Contest**
May 4–5	**Florida QSO Party**
May 4–5	**Late Spring QRP SSB Activity Weekend**
May 18–20	**Michigan QSO Party**
May 28–29	**CLARA Ac/Dc Mystery Contest**
Jun 8–9	**Worldwide South America CW Contest**
Jun 8–9	**ARRL VHF QSO Party**
Jun 22–23	**ARRL Field Day**
Jul 1	**CARF Canada Day Contest**
Jul 13–14	**IARU Radiosport Championship**
Jul 20–22	**CQ VHF WPX Contest**
Aug 3–4	**ARRL UHF Contest**
Aug 17–18	**New Jersey QSO Party**
Aug 17–18	**SARTG Worldwide RTTY Contest**
Sep 14–15	**ARRL VHF QSO Party**
Sep 14–16	**Washington QSO Party**
Sep 28–29	**Late Summer QRP CW Activity Weekend**
Oct 5–6	**ARRL QSO Party—CW**
Oct 12–13	**Rio CW DX Contest**
Oct 12–13	**ARRL QSO Party—Phone**
Oct 19–20	**ARRL Simulated Emergency Test**
Nov 2–3	**ARRL Sweepstakes—CW**
Nov 16–17	**ARRL Sweepstakes—Phone**
Dec 7–8	**ARRL 160-Meter Contest**
Dec 14–15	**ARRL 10-Meter Contest**

THE
BIRMINGHAM

NEWSLETTER OF THE MONTH

One of the most professional newsletters we have seen in a long time is the *BirmingHAM*, from the Birmingham Amateur Radio Club. It looks like a tiny magazine. In fact, the staff is large enough to support a full-sized publication! Along with Editor Fay Burt KA4VIK, the masthead lists seven columnists, one photographer, and several editorial assistants.

The result of all this input is an incredible wealth of information packed into each issue. And the photos—the last issue had *thirty!* But the *BirmingHAM* is not just a bunch of pretty pictures. Fay blends everything together to create a consistently informative journal. To Fay, the staff, and the 401 members of BARC, we extend our congratulations.

To enter your club's newsletter in *73*'s Newsletter of the Month Contest, send it to *73*, 80 Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

gether for total multiplier. No repeater contacts are allowed.

AWARDS:

Plaques to Michigan entries with high multi-operator/single-transmitter score, high Michigan score, high Michigan (Upper Peninsula) score, high aggregate club score, high VHF-only (100 QSOs minimum), high mobile, and high out-of-state. Certificates to high score in each county with a minimum of 50 QSOs. Out-of-state certificates for high score in each state and country.

ENTRIES:

A log and summary sheet are requested showing the scoring and other pertinent information, name and address in block letters, and a signed declaration that all rules and regulations have been observed. Michigan stations include club name for combined club score. Party contacts do not count toward the Michigan Achievement Award unless one fact about Michigan is communicated. Members of the Michigan Week QSO Party Committee are not eligible for individual awards. Decisions of the contest committee are final. Results will be final on July 30 and will be mailed to all entries. Mailing deadline is July 1. Mail entries to: Mark Shaw K8ED, 3810 Woodman, Troy MI 48084.

MICHIGAN ACHIEVEMENT AWARD

This will be the 27th year that hams have had their own program to publicize Michigan and its products. Just as for the past years, the Governor will award Achievement Certificates to hams who take part in telling the world of Michigan's unlimited resources, opportunities, and advantages. Certificates are awarded on the following basis:

1. A Michigan ham submits log information and names and addresses (if possible) of 15 or more contacts made to out-of-state or DX hams with information regarding Michigan.

2. An out-of-state ham, including any Canadian, submits log information and names and addresses (if possible) of at least 5 Michigan hams who relate facts to him about Michigan.

3. A foreign ham, excluding any resident of Canada, submits the call letters and name/address plus log information for at least one Michigan ham who has told him about Michigan.

Only QSOs made during Michigan Week, May 18-25, will be considered valid. All applications for certificates must be postmarked by July 1 and mailed to Governor James Blanchard, Lansing MI 48902.

CLARA AC/DC MYSTERY CONTEST

Starts: 0000 UTC May 28

Ends: 0000 UTC May 29

The contest is open to all YL and OM amateurs as well as SWLs. Each CLARA station may be worked twice, once on CW and once on phone, or same mode on two different bands. All contacts must be made in accordance with operator and station license regulations. No net or list operations, no crossmode contacts, no 10- or 2-meter repeater contacts. Three unidentified "mystery" stations will be operating during the contest.

EXCHANGE:

Name, serial number starting with 001, RS(T), QTH, and whether or not a CLARA member.

FREQUENCIES:

Phone—3775, 3900, 7150, 14160, 14280, 21300, 28488, 28588. CW—3690, 7035, 14035, 21035, 28035.

SCORING:

For the base score, CLARA members score 1 point per contact with nonmembers (whether OM or YL), 2 points per contact with CLARA members, and 3 points for each CW contact. Nonmembers score 2 points for each CLARA contact, 3 points for CW contacts. All multiply the base score by the number of Canadian provinces/territories worked for the total score. The contest manager will add 10 points to the base score of each log for every "mystery" station contacted.

AWARDS:

CLARA members are eligible for the 1st-place CLARA Cup and certificate or the 2nd-place certificate. Nonmembers will receive a plaque for 1st place, and certificates for 2nd place, 1st SWL, and 1st DX. All logs submitted are eligible for the mini prize drawing as well.

ENTRIES:

A single log entry must show date/time (UTC), band, mode, callsign worked, report and serial number sent, report and serial number received, name of operator of station worked, QTH, and points claimed. Logs must be signed and show full name, callsign and address of operator, and final score (points claimed not including mystery stations). Logs must be legible, no carbon copies, and no logs will be returned. Decisions of the contest manager will be final. Logs must be received by the contest manager before July 15. Address entries to: Muriel Foisy VE7LQH, RR#1, Pender Island, BC, Canada V0N 2M0.

BE MY GUEST

Guest Editorial by Edward Kessler WD4MJF/9

WAXING PHILOSOPHIC

Of all the many exciting, exotic, and enjoyable aspects of amateur radio, the most satisfying of all may very well be philosophy. An incongruity, you say? Perhaps, but bear with me for a few minutes and think about it as I explain.

My recent change of careers has given me the latitude to pause and reflect upon amateur radio not only as a technical hobby and public service, which it certainly is, but as a social mechanism which needs maintenance every bit as much as the equipment the hobby requires. Why did any of us pursue this hobby in the first place? To communicate, yes, but I submit that most of us, particularly those licensed since about 1960, chose amateur radio because we simply wanted not to be left out. We needed to participate in the conversations we heard on the air. Whether it was CW or AM made no difference. We felt left out. Many of us were SWLs of varying degrees of seriousness. This of course made us feel more intimately a part of a much larger and more interdependent world. Broadening our horizons, expanding our interests, and making us into international citizens is what amateur radio has always been able to do most easily, if we let it happen. The problem is how to make it happen.

Whether it be technological, social, or economic progress, in one way or another our fellow hams have always been in the vanguard. We have in recent years become stagnant in terms of social or economic usefulness. Rarely do we seem to be in the forefront of new technological breakthroughs or on the cutting edge of vital social issues. This is not to say we cannot once more regain the vibrancy which the hobby held in the past. We have only to regain the technical expertise and conversational ability that seems to have deteriorated over the last twenty years or so.

The pessimists believe that the operators who rant, rave, swear, and jam outnumber the rest of us. A casual listener on most bands would hear discussions of this sort of behavior and think the worst. What we must remember is that the ten to twenty folks doing the discussing are probably referring to one episode or person. It is, however, unfortunate that even a single episode should occur. From listening to some older hams, one would think that this type of behavior is a relatively recent phenomenon. We know better! I distinctly remember, as a listener in 1962, a W9 and W1 on 75 phone explaining how all of our problems were caused by Jews, blacks, Catholics, Kennedy, the Post Office, and God only knows who else. While I did not care for their philosophy, it stirred me enough to want my ticket. I did *not* want to be left out again. The good old days were never any better than they are now in this respect.

So, before we decide that the world and amateur radio are going to hell in a hurry, let's adopt a philosophy of finding something good in our fellow hams and striving to emulate them.

For instance, do contests just burn you up? Are you one of the group that complains about the wasted spectrum and time? Or are you envious of the operators who buy the megabuck station in order to participate in contests? It really makes no difference. The contests will be there, like them or not. You may as well try one. Not for the score, but as a courtesy to the operators who are in it for the sport and the score. I had heard for many years of the perfunctory nature of the contest QSO. While admittedly they are very brief (it is a contest), they *can* be very friendly. Participating in the 1985 World SSB Championship on both 40 and 75 meters, I was pleasantly surprised by the courtesy of VE3DDK, WA6PVA, WB7FDQ, KB0C, and VE3ICR, to name but a few. Thanks, guys. My sixty Watts and trap vertical made it difficult for you, but you stayed with me, probably losing several other contacts.

Are you tired of hearing the virtues of CW? Personally, it turns me off. Having been off the air for a couple years, I returned to the Novice portion of 40 meters recently. The reason was simple: Novices still have that sparkle in their eyes that we all have had at one time or other. Things there haven't changed, thank goodness. I met Nancy KA2VNM, who hung in there with me through the QRM and my rusty fist for the better part of 45 minutes. A *very* enjoyable contact and conversation. Thanks, gal.

We hear about hams not taking an interest in newcomers or would-be hams. Yes, I know all about the excuses. I have used some myself. But others manage to find time. Witness KC0GF, AJ0A, WB0MST, and spouse WB0MSU. Denis, Ken, Carol, Fritz, and the many other hams in Grand Island, Nebraska, not only give regularly scheduled classes for would-be hams, they practically ensure the students' success with their attention, courtesy, and friendship. Thanks to all of you.

Perhaps you cannot do something like this on such a scale. Then get involved with your local schools. Many hams now are older and do not have children in school. That is no excuse. We still pay taxes to support our public schools. If you aren't involved, you simply have no right to complain about the quality of education young people are getting! So let us make a concerted effort to be involved in the educational process of the youth in each of our communities.

Several years ago I read one of Wayne Green's editorials about topical CQs. I can probably count the number I have heard on one hand and still have fingers to type this. I know there are many hams in the military who have a diverse range of interests. There are many in various agencies of the government who are performing interesting and vital work which we would love to hear discussed. Businessmen and teachers, *surely* the topics of rigs and dipoles are incredibly boring after a few QSOs. Many of us are more than casual observers of international relations, if only because of DXing or broadcast QRM. We are better informed because of our hobby. What better place to discuss foreign affairs, banking, trade relations, and public opinion than on the ham bands? This may be the only way many of us can contribute to better understanding and coexistence with other nations and cultures. We are in an ideal position.

While we are talking about topical QSOs and CQs, I must comment that, unfortunately, the only one I have heard in the past three months was from a WA4 who insisted on using a reverberation unit while telling listeners those who would not be acknowledged. His expressed concern for the future of amateur radio and working young people is appreciated. However, there is still a place in our hobby for courtesy, tact, the zest for life, and the eagerness to meet and talk with new friends shown by the kids at school club station WB3BTD. Thanks, Teddy and Kristy. Hope to hear you on again soon.

Many of us remember hearing that we should not discuss politics, religion, or sex on the air. Times have obviously changed! These are subjects which are important in our society and to ignore them would be to ignore a most opportune way to open up other avenues of discussion. Obviously, a little caution is in order. I certainly do not expect to hear, "CQ,CQ,CQ, CQ sex therapy, CQ sex therapy, this is WD4###." I don't think I could explain to the in-laws! If you have a problem, see a doctor.

Do I have an axe to grind? Sure! I grow weary of the negative attitudes of many hams, the pessimists who say they are pragmatists and that nothing can be changed. They are correct unless we all adopt a philosophy of optimism. The goal should be to get each other to say, "Yes," or, "Maybe," or "Gee, I never thought about it that way."

Amateur radio is a philosopher's paradise. It can be a force again for social and economic advancement. We are the ones who must make it work. There is room at the top for all of us. All it may take is some regenerative feedback into the hobby to once again make that friendly force radiate.

REVIEW

TET HB 443 DX

I have some good news for you DXers and 40-meter operators. There's a new kid on the block who's here to answer your small-lot prayers. It's the TET HB 443 DX, and TET's DX suffix is no exaggeration. This four-element antenna has full band coverage on 10, 15, and 20 meters, and 50 kHz of bandwidth (under 2.0:1 swr) on the 40-meter band.

The antenna weighs in at a mere 39 lbs. (18 kg.). Boom length is 19.8 ft. (6 meters). Maximum element length is 30 ft. (9 meters). The antenna is capable of over 1 kilowatt of power and utilizes an air-core balun.

TET advertises gain factors over a half-wave dipole of 8.8 dB for 10 meters, 9.1 dB for 15 meters, 9.8 dB for 20 meters, and a healthy 5.2 dB for 40 meters. Front-to-back ratios fall in around 21.5 for 10, 15, and 20 meters. A 12.4 front-to-back ratio is listed for 40 meters.

The antenna is shipped in two 6-foot boxes to allow for UPS delivery. After unpacking all the pieces from both boxes, I uncovered the instruction manual. In my opinion, the instruction manual is the only flaw that the antenna has. It contains six pages of drawings with all dimensions in millimeters. The manual has no written material, so if you have any questions, don't bother to search through it for written instructions. This left me rather dumbfounded, because usually you are at least given some information on the adjustments for obtaining a low swr.

Relax, though—all my questions were answered once the antenna was assembled and erected. Seems the Japanese have taken all things into consideration and have done everything but send along a trained chimp to assemble it for us. All pieces are clearly labeled by the factory to ease the assembly. All element sections are pre-measured and pre-drilled. The only measurement which I had to make was for element placement on the boom.

TET also allows you to select which portion of 40 meters you wish to operate: CW, DX phone, or US phone. The US phone portion of 40 meters which TET has pre-drilled for is the Advanced portion of the band. I found it necessary to drill two new 1/8-inch holes. Each hole was made exactly 1 inch from the original phone-band holes to allow the antenna to be resonant on the General portion of the 40-meter band. This modification was only done on the driven element; you need not touch the reflector. You Generals may want to make this modification before erecting the antenna high atop a tower.

The entire antenna took me a total of 1 hour and 50 minutes to complete. Note: Be sure all ventilation holes on the traps face downward—this is important.

After erecting the antenna on top of my tower, I cranked the tower up to a height of 50 feet and went into the shack to check out the results for each band on the swr meter. Fig. 1 shows the frequencies and swr readings that were recorded without making any changes to the antenna.

Next was the real test: on-the-air reports. The first station worked was a YO2 in Romania. My report was 20 over S9. Not bad for running only 100 Watts output. I then worked a DF, an OE, and an OK, all of whom gave me 5 and 9 reports. I was really surprised to get those reports, even on 20 meters from a trapped yagi.

For three months now I've been working 10, 15, 20, and 40 meters with the antenna. Station EL1F reported 5 and 8 on 15 meters and station LU4MDR reported 5 and 9, to mention just a couple of the many DX contacts which I've made, all using 100 Watts PEP output. Since the antenna was erected, I have worked 79 new countries.

Now for the information you're all waiting to hear: How well does the antenna perform on 40 meters? Well, I can say this: If you have a full-size 3-element beam for 40 meters which is rotatable, I'm sure that it would outperform the HB 443 DX on 40 meters. But, if you're like most of us who are struggling with dipoles, inverted vees, and delta loops, then this antenna might be what you're looking for.

I made all comparison tests against an inverted vee with its apex at 60 feet and a half-wave dipole at 50 feet (while operating on the 40-meter phone band). The TET antenna is mounted on a 52-foot tower. All contacts were made stateside. In every instance the HB 443 DX gave me 2 to 3 S-units higher signal than the dipole or the inverted vee. In many cases I could not even hear the stations when I switched over to the dipole or the inverted vee. I might add that the TET antenna did a good job of nulling down the broadcast station noise on the band when turned away from the source.

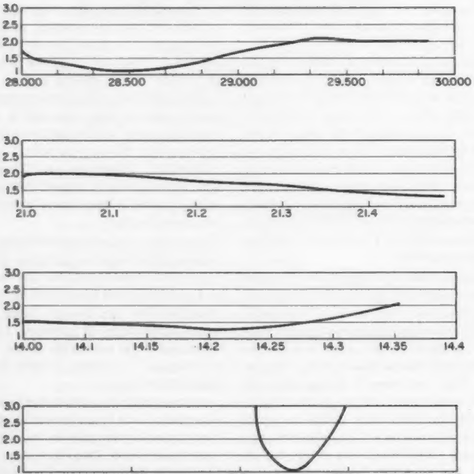
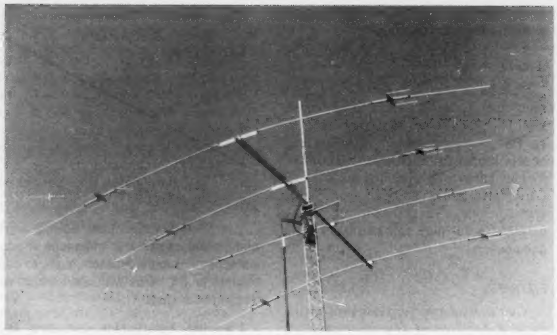


Fig. 1.



The TET HB 443 DX.

So, to wrap it all up, in my opinion TET has really got a super antenna here that is going to start turning some heads. If the HB 443 DX is still a bit big for you, then you might take a look at its little brother; the HB 433 DX. It's a 3-element, four bander on a 13-foot boom, weighing around 30 lbs.

I hope that the preceding article has been helpful and has answered some of the questions you may have had about the HB 443 DX. At least it will let some of you know that a new antenna for 10 through 40 meters is here. Good DXing and see you on the bands.

For further information, contact *Lunar Electronics, 2775 Kurtz Street, Suite 11, San Diego CA 92110-3170; (619)-299-9740.*

Robert Matthews KA3JOM
Baltimore MD

SSD-16010-C NINE-BAND SPACE SAVER DIPOLE

Until fairly recently, I had a very convenient QTH for antennas. My backyard easily accommodated various dipoles as well as a 300-foot longwire. The oak trees provided very solid and dependable supports for my experiments with loops, deltas, and verticals. However, as the size of my family increased, the house became too crowded and we ended up making a move to a larger house on a (sadly) smaller lot. Good-bye, antenna farm—my new quarter acre was never intended for such luxuries. What to do?

I came across an ad for the W9INN nine-band Space Saver Dipole ($85.00) and found the solution to my particular problem. It may work for others as well. This antenna is a compromise. After all, a 46-foot-long dipole cannot be expected to work quite as well as a half-wave antenna, but the results are more than satisfactory.

The SSD-16010-C is designed to cover 160 through 10 meters (including the 30-, 17-, and 12-meter bands). There are two parallel elements separated by four spreaders. One pair of elements covers 80, 30, and 20 meters, while the others cover the remaining bands. A wide-range antenna tuner is required (my ultimate transmatch works fine) and you can order the antenna in either coax or ladder-line versions. There is a very solid center insulator (the Unadilla W2AU "Ansulator").

The antenna operates as a dipole on all bands except 160, where it is used as a Marconi. A feedline of at least 40 feet is required for operation on the Top Band. The Space Saver Dipole has no traps: Instead, four inductors are used. The antenna will run full legal power on all bands and can be used as a dipole, inverted vee, or sloper. You can fold the elements and reduce the overall size to only 30 feet, making the Space Saver Dipole a candidate for installation in the attic. The antenna comes fully assembled except for the spreaders, which can be installed in minutes. The elements, coils, and hardware (stainless) are all very good quality and should last very well under the most hostile environments.

I managed to run a line over an oak tree branch at the 40-foot level (lucky throw) and hauled the Space Saver Dipole into place as an inverted vee. It has worked very well on all bands from 80 through 10 meters (I don't operate 160 meters right now). The results are down from those encountered using a full-size dipole at a comparable height at the old QTH, but I am satisfied with the results. As a casual operator on phone and CW, I use a variety of bands and try to operate at off-peak hours. This may very well contribute to the other stations' ability to hear me.

Overall, the Space Saver Dipole is a very worthwhile investment for anyone who has limited space and must compromise on the antenna system. It is very well made and is reasonably priced. I have recommended it to several people on the local repeater who have similarly small lots. This antenna provides a large coverage in a small package.

For further information, contact *W9INN Antennas, PO Box 393, Mt. Prospect IL 60056.*

Thomas Mart AD1B
Dedham MA

COMPUTER PROGRAMS FOR AMATEUR RADIO

There are an awful lot of microcomputers finding their way into ham shacks these days. There are almost as many bewildered hobbyists hungry for information about how to make their new computer do some of the amazing things they have read it can do. *Computer Programs for Amateur Radio*, written by Wayne Overbeck N6NB and James Steffan KC6A, helps to fill in the information gap.

Sitting in the bookstore, the book is physically impressive, running well over 300 pages in length. It promises "high-performance programs written in Basic for your Apple, TRS-80, or Commodore 64, plus conversion guides for the IBM PC." As it turns out, it delivers programs for not only these machines, but any machine capable of running CP/M and even some that will run on the Timex/Sinclair and the VIC-

20. Keep in mind, however, that many of the most impressive programs require a machine expanded to 48K of memory or more.

Trying to gauge the audience for a book can be difficult. If you start at too elementary a level, more experienced readers are put off. Start too deep, and very few will understand what you are saying.

I would judge this effort as being aimed at mainly the newcomer to using computers. The first five chapters of the book are an overview and history of the home computer. They are well written. While interesting and informative, they will not tell you everything you ever wanted to know about home computers. If you have been computing for a while, I doubt you will learn anything new here.

My main reason for buying the book was to get the programs it contains, and there are a lot of them. In computer terms, many of the programs are "data base managers," that is, they aid in storing and retrieving information. Several others are calculation aids for scaling antennas, figuring actual power at the antenna, moon tracking, EME calculations, and so on.

There are no CW or RTTY send and receive programs, no slow-scan television programs, and, in fact, no hardware interfacing programs of any kind. The authors indicate that this is to avoid "needless duplication" of existing programs.

It would be difficult to write programs that are transportable enough to run on many computers and address the special hardware interfacing requirements of each machine.

Here's a list of what's included: Logbook, Radio Awards Data Base, Grid Locator, Worldwide "Catalog File," Sunrise Chart, Sunrise Calculator, Grayline, Beamheading Chart, DX Display, DX Checker, Dupe Checker, Dupe Print, Contest Logger, Generalized Logger, Field Day Logger, Sweepstakes Logger, Log Print, Antenna Scaler, Antenna Evaluator, Phased Vertical Pattern Plotter, EME System Analyzer, Moontracker, and Skylocator.

This is indeed a good variety of non-hardware-type programs, and they all work! In the Commodore programs I found only one error of sorts. In Commodore Basic, to raise a number to a power, you use an "up arrow." In the book this is denoted as an up caret. I guess the typesetter ran out of arrows after the last book on vectors was published.

Additionally, in the book all of the printer routines for the Commodore programs are set up for RS-232 printers. I think I am one of the few people in the world who have Commodore computers feeding an RS-232 printer. To the authors' credit, the correction sheet and the disk take this into account and set up the programs with the more standard Commodore device #4.

Several programs are really variations on the same theme. For example, the DX Display and Beamchart programs both use the massive latitude and longitude file, as do several of the other programs. The logbook and contest programs are all built on similar programs.

Some of the programs have been around in the public domain for some time. It is still impressive though to watch your $200 computer produce moon-tracking printouts or provide you with sunrise and sunset times for a bunch of cities around the world on any given day.

The antenna-matching program may yield a surprise about what kind of power you actually have at your antenna, and the EME program is certain to make you yearn for a country estate on which to reenact the Arecibo dish!

The programs all work as advertised, though in some instances the screen display doesn't look very good. I did not find that problem with the printouts produced by the programs.

If you are like me, you like typing programs in from a book or magazine almost as much as you enjoy a good root canal on a sunny day. A prepared disk is available for most computers for an additional fee. I was certainly glad I ordered that for my Commodore 64. Otherwise, I think the book would still be sitting on the shelf with very few of the programs actually typed in.

As you contemplate taking home this 300-page book, keep in mind that only a fraction of those pages will contain information for your particular computer. Expect to do a lot of typing without the advantage of an error-checking program. I strongly recommend the disk to go with the book, which almost doubles the cost.

Computer Programs for Amateur Radio can serve as a jumping-off point for the new computer owner. It would make a good addition to a club library.

Computer Programs for Amateur Radio is available for $16.95 from *Hayden Book Company, Hasbrouck Heights, New Jersey*. Your local bookstore may also have it or can order it by requesting ISBN 0-8104-0657-8. The disk is an additional $13.00.

Jim Grubbs K9EI
Springfield IL

THE COLATCHCO 40-METER INSTARRAY

Since 1975, Dana Atchley, then W1HKK and now W1CF, has been writing about vertical phased arrays. There are some of us who think that he may have the premier signal in the world on 80-meter phone. Recently he has teamed up with Fred Collins W1FC, a co-worker at M/A-COM (formerly Microwave Associates), to create a new entry in the ham-radio antenna manufacturing field. ColAtchCo, formed by mingling the names of the two principals, is in the business of manufacturing practical vertical phased arrays. In other words, it is no longer necessary to merely dream about developing some gain on 40, 80, or 160.

A 40-meter version of the ColAtchCo four-element vertical phased array was erected at K1VR in the fall of 1983. This is the report on that antenna.

Description

The array consists of four verticals set in a square, with sides of 34 feet 5 inches and diagonals of 48 feet 8 inches. Each vertical is made of 6061T6 drawn aluminum tubing, in several sections, with smaller diameters as height increases. A radiator has five six-foot sections topped by a three-foot section. This is the same design for element construction commonly seen in yagis.

In the 40-meter array, the elements are self-supporting and no guy wires are required. Each element sits on a Delrin insulator which is inserted into a steel pipe. The pipe is simply banged into the ground here (not a very demanding job), though the manufacturer recommends pouring concrete footings.

At the center of the array, again sitting on a simple steel pipe five feet long, a relay box receives a 90-degree phasing line made of RG-213 from each vertical. A low-voltage switching line and coax feedline (again RG-213 in my case) then go into the house.

Installation

The 40-meter array is UPS shippable and is reasonably well boxed, so damage in transit should not be a problem. Also, there are hardly any parts which could be damaged by shaking.

Upon opening the box, the use of stainless steel, even for hose clamps, is apparent. The nice thing about these hose clamps, however, is that they have both a stainless-steel wrap *and* a stainless-steel screw. In case you haven't been buying clamps lately, it is very easy to find clamps where the wrap is stainless but the screw is merely plated.

After counting parts against the instruction manual's list, it becomes apparent that there is a considerable amount of work to do before actually erecting the verticals. The site must be selected and the grass mowed (a tip from old-time vertical erectors—mow any grass *very* short and then lay the radials out, holding them down with jumbo-size paper clips rebent into a U shape and pushed into the earth with the radial wire underneath, or staple the radials to dowels driven into the ground). After a few weeks, the radials will simply disappear. The instructions as to setting up the square layout so that all vertical radiators will be in line obviously reflect some field experience, and they were very useful.

About this time, just when I was hoping that it might be possible to erect the verticals that very day, I discovered that there were several items required in the way of tools or materials which were not included in the kit of parts. Not to worry, however. Atchley responded immediately to my suggestion and now promises to include a list of tools and materials.

ColAtchCo sells wire for radials as a separate item, knowing full well that many hams will have some surplus house that they may wish to frequent. In my case, that's exactly what I did, coming home with 10,000 feet (almost two miles!) of #20 AWG insulated wire for a very reasonable $75.00 from Eli Heffron & Sons, a Cambridge MA surplus house. However, before trotting off to the surplus house, I did check around with a few retail stores and wire houses. ColAtchCo prices for the radial wire turn out to be very reasonable, indeed.

Photo A. The pipe mount is simply sledgehammered into the ground. Note the simple ground system attachment: a long 1/4" #20 bolt with radials soldered into grounding lugs. The two black horizontal stripes are some spare tape left on the pipe.

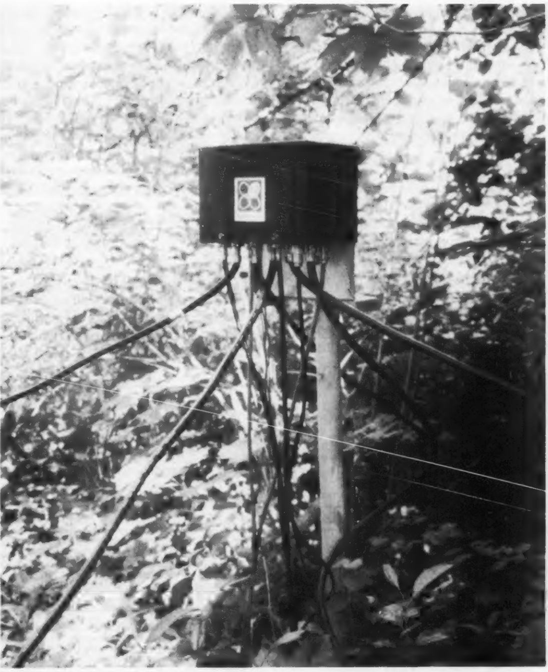


Photo B. Outdoor relay box mounted on owner-supplied pipe. SO-239 connectors are protected from the weather, but ColAtchCo recommends a plastic trash can, too. Phasing lines came pre-cut. No dummy load is evident because I ran an RG-58 line back into my cellar where I put a Heathkit Cantenna.

By the way, there is some reason to believe that insulated wire is superior to bare or tinned wire for these applications. Archibald C. Doty, Jr. K8CFU made such a claim in his article, "Improved Vertical Antenna Efficiency: A Study of Radial Wire Ground Systems," in *CQ*, April, 1984, page 24.

After careful measuring for correct placement, pounding the base stakes into the ground turned out to be simplicity itself. Here in New England, there is a very real advantage to using steel stakes with Delrin insulators instead of the traditional bottles, or other insulators. The advantage is that you can use a sledgehammer on the metal stake, whether or not the insulator has been inserted. The Delrin survived quite nicely. In addition, in the ColAtchCo system the feedpoint is moved a few feet above ground so that the snow won't be a problem around the time of the ARRL DX contest in the dead of winter.

Coax phasing lines were provided. Worried at first about the fact that they were crimped instead of soldered, I phoned the folks at Gilbert (connector people), who were able to satisfy me that crimped connectors are okay for outdoor work. In addition, these phasing lines are made out of a recognizable Saxton coax, not some unknown brand or generic coax.

At the center of the four vertical radiators ColAtchCo requires its relay box. It appears that they are buying these boxes from Heathkit, as the boxes bear a very close resemblance to the outdoor box in the Heathkit remote coax switch. Further investigation shows that this is *not* the case, and that the relay boxes are specially manufactured for the application. However, the box is obviously a great idea, as it is a proven design and puts all connections on the underside for weather protection.

ColAtchCo uses very ordinary plug-in relays inside the relay box. This is really neat, as the relays are well proven, can easily be replaced should some guest operator change directions while transmitting and fry one, and can be replaced on the worst of days without a soldering iron—they are, I repeat, plug-in. Of course, when considering such advantages, the mind continues to think thoughts of how painful it is to work on a 40-meter beam in the dead of winter, at a height where one would really want a 40-meter beam (upwards of 70 feet).

It really is true that one man can erect the 40-meter version. I have also witnessed one man erect the 80-meter, 42-foot version (more about that later). On the other hand, it really does, in a practical sense, take two men to erect the full-size 80-meter vertical radiator.

In preparation for the erection, be sure to think about tree branches that may get in the way should the radiator be lifted in any given direction. I had to do a very small amount of tree trimming.

With the 40-meter version, since one man can easily move it around once it is lifted vertically, I stuck it up in the air like a flag held in a marching band and walked it to the stake on which it would be mounted.

Now get this: There are *no* guy wires on the 40-meter array. The thing is really self-supporting. And note this nice little construction detail: They even provide a cap for the top of the vertical radiator so that water won't drip down the inside of the tubing.

Aesthetically, the fact that there is no guying of the 40-meter array means that the thing is hardly visible. At a total height of 33 feet, it cannot be seen over my one-story ranch house. The array gets lost in my backyard, and although I know what I am looking for, it is extremely hard to see. Not bad for an array which really does develop gain on 40.

Measurements

The results of swr measurements across the band may be quickly summed up. The array is almost flat across the band, at 1.4 to 1 or better. I believe that the differences between directions can be accounted for in the locations of trees, and a small tower some 55 feet away.

As a result of mutual coupling, power will be dumped into a dummy load (which, by the way, must be customer supplied—I use a Heathkit "Cantenna"). For a given frequency, power dumped into the dummy load did not vary. Curiously, however, the power did vary much more drastically than the swr, according to the frequency in use. At 7 MHz, 18 Watts went into the load, at 7.15 MHz, 6 Watts, and by 7.3 MHz, it was back up to 12 Watts. This is not unexpected, as the instruction manual specifies than unless a special order is placed, the antenna comes cut for 7.15 MHz. Given the low swr across the band, this center frequency is entirely satisfactory.

Performance

I used the array for 40-meter monoband entries in both the phone and CW versions of the 1983 *CQ* WW DX Contest. My totals were: phone—184 contacts and 24 zones; CW—327 contacts in 84 countries and 28 zones. This is where my observations become relevant, because I got clubbed by the big multi-multi stations with 3-element arrays (or even 3 over 3) way up in the sky.

Let's face it, at 4.5 dB claimed gain, the array simply doesn't develop the same kind of signal that some of the really big antennas are capable of developing. But then comes the question of how the array compares to 2-element shorty-forty antennas. It was my experience that it ran about even with the Hy-Gain and Mosley and lost to the Cushcraft. But those antennas had to be at 70 feet or longer.

There were other factors, too. I noticed that on long hauls, such as Antarctica, VK, ZL, FB8, ZS, most of South America, and the Pacific, the antenna system performed very well. On the other hand, on high-angle signals into Europe, I saw better performance from my 40-meter delta loop (used for comparison) or my 80-meter dipole fed with balanced feedline (which acts as two half waves in phase on 40 but is only 35 feet high).

I would conclude that verticals have their advantages and their disadvantages. In New England, however, it seems clear to me that the verticals do offer the opportunity to erect a gain antenna on a modest suburban lot without getting into zoning or neighbor trouble, and to be competitive.

Before leaving the subject of comparing performance to that of the 40-meter beams, I should mention one decided advantage that is available to the vertical system owner. Most rotatable antennas work on one-rpm motors. That means that if it is sunrise in Europe (at 0600 UTC) and sunset in the Pacific, it can take 30 seconds to go from working some G to pick up that KH6, and another 30 seconds to go back to working Europe.

On the other hand, using the ColAtchCo array, switching is instantaneous, saving time. In a multi-multi effort, this is of less consequence, since the goal is to work every station on the band eventually. For the single operator in the allband category, however—the operator who wants to work as much as he can and then get out of there—the instantaneous switching arrangement is quite advantageous.

Cost

Though a complete price list is available from the company, one must piece together the elements required. ColAtchCo has recognized that some hams will want to buy only the relay box, only the vertical radiators, only the adjustable inductor, or some combination of the many things that they sell. However, a complete 40-meter array, less only the radials, will cost $856 plus shipping. This does not compare well to the purchase of a two-element short beam alone. However, if a tower, some extra guys, tower climbing help, a new rotator, or other considerations are added to the figuring, the price seems reasonable.

In my situation, I purchased the system while litigating a tower case in the local courts. It allowed me to get on the air with a reasonable signal right away, without pouring concrete and without a 70-foot tower. As I also plan to do some multi-single (multi-operator, single-transmitter) contest work, having an antenna which was "rotatable" without affecting the operation of the main tribander was a real advantage.

Other Arrays and New Products

ColAtchCo has just announced that they are offering an 80-meter vertical which is only 42 feet tall, using a "top hat" made of sloping wires which are continued as guy lines. John Kaufmann W1FV (unaffiliated with ColAtchCo) has done extensive investigation on the theory of such antennas, and he confirms to me that his own experiments with a 39-foot vertical on 80 show a negligible difference between that size and a full-size quarter wave.

Another new product is an 80/160-meter vertical, with top hat guy-wire loading, and a center-loading adjustable inductor, which should be much more efficient than bottom loading. ColAtchCo claims a bandwidth of approximately 50 kHz on 160. This product will be reviewed at another time.

Sadly, ColAtchCo has not yet invented what I would really like. I'd like to increase the height of my existing array from 32 feet to 42 feet, add the top hat, and then have a two-band array: four half waves at a quarter-wave spacing on 40 and four quarter waves at one-eighth-wave spacing on 80. Then I would simply erect a single 160-meter vertical elsewhere on my property.

The other configuration which they haven't invented yet, suitable for my yard, would be a two-element 80-meter array, switchable so that both elements are also usable as a directional array on 160, with gain.

Despite my disappointment that they haven't invented what I really want yet, I am very interested in their work. I'm staying tuned.

It looks as though the initial products introduced by ColAtchCo are well built and they work. They appear to be on the edge of some clever engineering which will permit multiband, low-band, direction-switchable gain antennas without zoning problems. Not bad.

A brochure, including a fairly detailed discussion of what they do, and price list are available from *ColAtchCo, PO Box 230, Carlisle MA 01741*. They do have a telephone, *(617)-371-1242*, but it is not always manned by a human.

Fred Hopengarten K1VR
Lincoln MA

WHAT DO *YOU* THINK?

Have you recently purchased a new product that has been reviewed in *73*? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73 Magazine*, Peterborough NH 03458.

FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

A VIDEO VENTURE

Here's the question of the month: Why isn't ham TV more popular?

It puzzles me. Most hams I know are very outgoing. Most will drag people off of street corners to look at their stations. Most will talk your ear off about the wonders of ham radio. But few have ever operated TV.

Yes, I know SSTV is relatively popular. But I'm talking about ATV—standard fast-scan video—the type you can watch "Laverne and Shirley" or "The Honeymooners" on (if you cut out the music, of course).

It's hard to come up with a reason for the downright unpopularity of ATV. Okay, most of us aren't what you might call handsome, but that never stopped hams from going to club meetings or speaking up in front of a group at a ham convention. No, looks aren't the problem.

I think most hams have just never thought about ATV. We know that it's there, but I don't think we know how much fun it can be. Well, my face has cracked a few vidicons and monitors in its time, and I can tell you that ATV is a lot of fun.

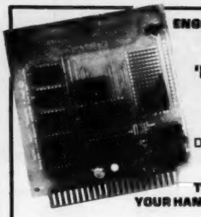
With low-cost portable VCRs now available all over the place, you can put together mini-documentaries on your club's latest meeting or hamfest. You can show the ham world, in color, just how fantastic your stacked array is. Why, with a little ingenuity, you can even figure a way to play video games over the air. Want to have ham radio to impress a kid? Then show him (or her) ATV.

So get off your Cantenna and look into the world of ATV. And if you need some inspiration, let this month's quiz put you into the mood.

ELEMENT 1
MULTIPLE CHOICE

1) The event at which TV had its first public demonstration was:

1) The 1933 Presidential Inaugural



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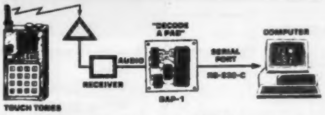

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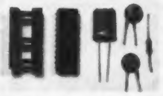

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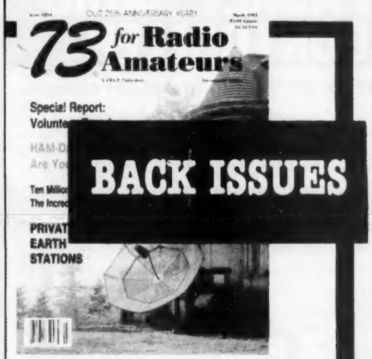

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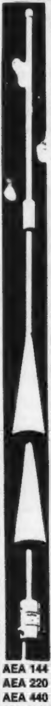

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KITTY SAYS: WE ARE NOW OPEN 7 DAYS A WEEK.
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ONV Safety belts-in stock

ICOM
IC-R71A, IC-751, IC745, IC-27A/H, IC-37A
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YAESU
FT-ONE, FT-980, FT-757GX, FRG-8800
FT-726R, FT-77, FT-270RH, FT-2700RH

SMART PATCH
CES-Simplex Autopatch 510-SA Will Patch FM Transceiver To Your Telephone. Great For Telephone Calls From Mobile To Base. Simple To Use - $319.95.

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R-600, R-1000, R-2000, TS-940 S/AT
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YAESU	ICOM	Land-Mobile H/T
FT-1/2/703R	IC2AT	Midland/Standard
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NCG 7-21-50 Transceiver

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ROCKWELL/COLLINS KWM-380
VoCom/Mirage/Daiwa Tokyo Hy-Power Amplifiers & 5/8λHT Gain Antennas IN STOCK

Large inventory of Saxton Wire & Cable

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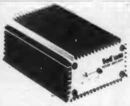

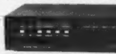

Computer Interfaces stocked: MFJ-1224
AEA CP-1, PKT-1, DR.DX
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Yaesu FTR-2410, Wilson
ICOM IC-RP 3010 (440 MHz)
ICOM IC-RP 1210 (1.2 GHz)

SANTEC
ST-222/UP
ST-142/UP
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HT-7

ALPHA AMPLIFIERS

MFJ Models 422, 989, 1224 & 941D

HAM MasterTapes— Beta or VHS Tapes

MURCH Model 2000 A, A-LS, B In stock

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MICROLOG-AIR I, Air Disk

KANTRONICS
UTU, Interface II, Challenger

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Trionyx-	Pro-Com Engineering	
Model TR-1000	0–1 GHz	1200HH
0–600 MHz	0–1.3 GHz	1299HH

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Tri-Ex Towers

Hy-Gain Towers & Antennas, and Rotors will be shipped direct to you FREE of shipping cost.

AEA 144 MHz
AEA 220 MHz
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ANTENNAS

BIRD Wattmeters & Elements In Stock

BENCHER PADDLES, BALUNS, AUDIO FILTERS, IN STOCK

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DENTRON IS BACK IN STOCK!

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2591 HT, Corsairs, Argosy II, Century 22

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Local Ham Club Speeches Given

COMMERCIAL RADIOS stocked & serviced on premises.
Amateur Radio Courses Given On Our Premises, Call
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2) The 1939 New York World's Fair
3) The 1936 San Francisco World's Fair
4) The 1933 Chicago World's Fair

2) In 1955, what weighed 280 pounds, used 35 tubes, and required 375 Watts of power?
1) A color TV camera
2) A color TV receiver
3) A color TV transmitter
4) A color video switcher

3) What are the two basic TV scanning systems?
1) Interlaced and sporadic
2) Interlaced and random
3) Random and sequential
4) Sporadic and sequential

4) Which of the following sit-coms *never* had an episode dealing with amateur radio?
1) "Hazel"
2) "The Munsters"
3) "Green Acres"
4) "My Favorite Martian"

5) The first TV station to broadcast on a regular basis was:
1) WNBC, New York
2) WGY, Schenectady
3) KNXT, Los Angeles
4) WXTV, Philadelphia

ELEMENT 2
TRUE-FALSE

True False

1) A Plumbicon is a type of TV picture tube. ____ ____
2) An image orthicon is a video pickup tube used in state-of-the-art TV cameras. ____ ____
3) CBS proposed the first "all electronic" color TV system. ____ ____
4) WR4AAG was the first ATV repeater. ____ ____
5) From the late 1920s through the late 1930s, the most popular television character was Felix the Cat. ____ ____
6) TV video is transmitted in FM. ____ ____
7) TV audio is transmitted in AM. ____ ____
8) The TV movie, "The Day After," prominently featured ham radio. ____ ____
9) NBC's first TV station was New York's W2XBS. ____ ____
10) "Channel 1" is now the amateur 2-meter band. ____ ____

ELEMENT 3
MATCHING

Match the TV pioneer in Column A with his accomplishment in Column B.

Column A	Column B
1) John L. Baird	A) German scientist who invented the scanning disk
2) K. F. Braun	B) Englishman who formed the first company exclusively devoted to television
3) Paul Nipkow	C) Invented the cathode ray tube
4) Vladimir Zworykin	D) Russian emigre who invented the image iconoscope
5) E. F. W. Alexanderson	E) Chief television consultant for General Electric, he conducted many important TV experiments for the company in the 1920s F) Invented the "radioscope"

ELEMENT 4
FILL IN THE BLANK

1) A US TV picture ordinarily contains ____ lines.
2) ATV audio is usually carried on a ____ MHz subcarrier.
3) The standard vertical sweep frequency is ____ MHz.
4) VIR is the abbreviation for ____ ____ ____
5) The time prior and subsequent to the sync pulse is the ____ period.

THE ANSWERS

Element 1:

1—2	April 20, 1939, to be exact.
2—1	Not exactly what you would call a mini-cam.
3—2	The interlaced system is the one most commonly used.
4—3	Remember Mr. B's TVI problem? Remember Herman talking to Mars (the planet, not the service) on his radio? Remember Uncle Martin's alibi for all that strange electronic equipment? The networks sure had a strange view of our hobby.
5—2	In 1928.

Element 2:

1—False	It's a video pickup tube used in TV cameras.
2—False	Image orthicon tubes have not been widely used for about 20 years.
3—False	CBS's system featured a spinning mechanical disk.
4—True	In Washington DC.
5—True	A foot-high statuette of Felix was used in a variety of TV tests during those years.
6—False	No, AM.
7—False	No, FM.
8—True	Sure. Remember all those poor survivors radioing for help from the college's radio club?
9—True	As the call indicates, it was an experimental station. The year was 1931.
10—False	Six meters.

Element 3:

1—B, 2—C, 3—A, 4—D, 5—E.

Element 4:

1—525
2—4.5
3—59.94
4—vertical interval reference
5—blanking

SCORING

Element 1:
Seven points for each correct answer.
Element 2:
Three points for each correct answer.
Element 3:
Eight points for each correct answer.
Element 4:
Five points for each correct answer.

How did you do?
1-20 points—In a blind spot
21-40 points—Waiting for Uncle Miltie's return
41-60 points—One set home
61-80 points—Man of vision
81-100+ points—Video Ranger

LIMITED ANTENNA SPACE?
B & W OFFERS SIX SOLUTIONS!

Barker & Williamson offers six new multiband trapped dipoles made to fit in less space than conventional antennas. You may not have room for that dream antenna farm, but no longer need limit your operating to one or two bands. These new antennas provide low SWR on **every** band making a great companion for today's solid state rigs.

- Direct feed with 52 OHM Coax
- 1 KW CW, 2 KW P.E.P. SSB
- SO-239 Termination

MODEL	BANDS	LENGTH	PRICE
AS - 160	160, 80, 40, 20 METERS	137 Ft.	$129.00
AXS - 160	160, 30 METERS	96 Ft.	99.00
AS - 80	80, 40, 20 METERS	78 Ft.	99.00
AXS - 80	80, 40, 15 METERS	64 Ft.	99.00
AS - 40	40, 20, 15, 10 METERS	40 Ft.	129.00
AS - 20	20, 15, 10 METERS	23 Ft.	99.00

ADD $2.00 SHIPPING & HANDLING

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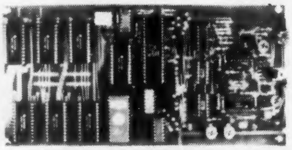
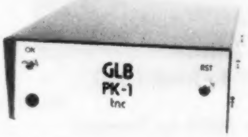
GLB PACKET RADIO CONTROLLER

Now you can get in on the fun in packet radio!

- Ready to operate - wired and tested - **Low Cost**
- Operates with Voice Transceivers.
- Easy to learn, easy to operate.
- Built in Packet Modem and CW identification.
- Use with a computer, terminal or Teletype Machine.
- Terminal Code is ASCII or BAUDOT.
- Terminal Speeds from 45 to 9600 Baud.
- Radio Link Speeds of 300, 600 or 1200 Baud.
- Automatically selects **AX.25** or **VADC** protocol.
- Remote Command Lockout for repeater control.
- Full 8-digipeater operation in AX.25.
- Over 90 Commands.
- Stores received messages for delayed reading.
- Able to display other calls while connected.
- "Block" and "Transparent" modes for data files.
- Operates as an unattended digipeater.
- "Beacon" mode.
- Signals available for Teletype Motor Control.
- Standard memory is 4K, expanable to 14K.
- 56K RAM available on special order.
- Can be customized for **LAN's**.
- Squelch input for sharing of voice channels.



MODEL PK1
(Shown with 14K RAM and 8K ROM)



Dimensions: 4.5 X 9.5 X 1.5 (inches)

Power Requirement: 12 volts DC at 200 ma.

PK1 -	Subassembly board (wired and tested, less case)	$164.95
M2K -	2K Additional memory, installed and tested	$ 10.00/2k
PKDOC -	Documentation only, refundable on first PK1 purchase	$ 9.95
PKCBL -	Set of 4-ft cables (DB-25 to 10 pin; uncommitted to 10 pin)	$ 19.95
PKCNT -	10 pin edge connector only (2 required)	$ 2.95
PKPWR -	Power supply (115V input)	$ 9.95
PKCAB -	Cabinet kit	$ 34.95
PKTTY -	Teletype adapter (Teletype machine as terminal)	$ 17.95
PKWD1 -	WATCHDOG assembly (for unattended repeater use)	$ 17.95
PKLA1 -	RS232 Level Converter (converts PK1 RS232 to + & - Voltages)	$ 21.95
PKCPK -	CPK Program (specify disc size, format, and computer)	$ 34.95
PKS24 -	Each addl. socket installed for memory expansion - 24 pin	$ 2.00
PKS28 -	Each addl. 28 pin socket	$ 2.25

Please specify Call Sign, SSID Number, and Node Number when ordering.

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ALSO HAS THE MOST IMPRESSIVE PERFORMANCE FEATURES

(AND GIVES THEM TO YOU AS STANDARD EQUIPMENT!)

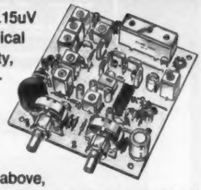
Band	Kit	Wired
10M,6M, 2M,220	$680	$880
440	$780	$980

hamtronics
REP100 REPEATER

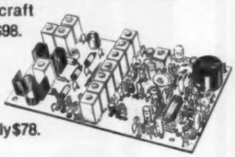
FEATURES:

- SENSITIVITY SECOND TO NONE; 0.15 uV (VHF), 0.2 uV (UHF) TYP.
- SELECTIVITY THAT CAN'T BE BEAT! BOTH 8 POLE XTAL FILTER & CERAMIC FILTER FOR > 100 dB AT ± 12KHZ. HELICAL RESONATOR FRONT ENDS TO FIGHT DESENSE & INTERMOD.
- OTHER GREAT RECEIVER FEATURES: FLUTTER-PROOF SQUELCH, AFC TO COMPENSATE FOR OFF-FREQ TRANSMITTERS, SEPARATE LOCAL SPEAKER AMPLIFIER & CONTROL.
- CLEAN, EASY TUNE TRANSMITTER; UP TO 20 WATTS OUT (UP TO 50W WITH OPTIONAL PA).

HIGH QUALITY XMTR & RCVR MODULES FOR REPEATERS, LINKS, TELEMETRY, ETC.



- **R144/R220 FM RCVRS** for 2M or 220 MHz. 0.15uV sens.;8 pole xtal filter & ceramic filter in i-f, helical resonator front end for exceptional selectivity, > 100 dB at ± 12 kHz, best available today. Flutter-proof squelch. AFC tracks drifting xmtrs. Xtal oven avail. Kit only $138.
- **R451 FM RCVR** Same but for uhf. Tuned line front end, 0.3 uV sens. Kit only $138.
- **R76 FM RCVR** for 10M, 6M, 2M, or 220. As above, but w/o AFC or hel. res. Kits only $118. Also avail w/4 pole filter, only $98/kit.
- **R110 VHF AM RECEIVER** kit for VHF aircraft or ham bands or Space Shuttle. Only $98.



- **T51 VHF FM EXCITER** for 10M, 6M, 2M, or 220 MHz. 2 Watts continuous, up to 3 W intermittent. $68/kit.
- **T451 UHF FM EXCITER** 2 to 3 Watts. Kit only $78. Xtal oven avail.
- **VHF & UHF LINEAR AMPLIFIERS.** For either FM or SSB. Power levels from 10 to 45 Watts to go with exciters & xmtg converters. Several models. Kits from $78.

NOW—FCC TYPE-ACCEPTED TRANSMITTERS & RECEIVERS AVAILABLE FOR HIGH-BAND & UHF. CALL FOR DETAILS.

RECEIVING CONVERTERS

Models to cover every practical rf & if range to listen to SSB, FM, ATV, etc. NF = 2 dB or less.

RECEIVING CONVERTER

VHF MODELS

Kit with Case	$49
Less Case	$39
Wired	$69

UHF MODELS

Kit with Case	$59
Less Case	$49
Wired	$75

Antenna Input Range	Receiver Output
28–32	144–148
50–52	28–30
50–54	144–148
144–146	28–30
145–147	28–30
144–144.4	27–27.4
146–148	28–30
144–148	50–54
220–222	28–30
220–224	144–148
222–226	144–148
220–224	50–54
222–224	28–30
432–434	28–30
435–437	28–30
432–436	144–148
432–436	50–54
439.25	61.25

SCANNER CONVERTERS Copy 806 MHz band on any scanner. Wired/tested ONLY $88.

TRANSMIT CONVERTERS

For SSB, CW, ATV, FM, etc. Why pay big bucks for a multi mode rig for each band? Can be linked with receive converters for transceive. 2 Watts output vhf, 1 Watt uhf.

For VHF,
Model XV2
Kit $79
Wired $149
(Specify band)

For UHF,
Model XV4
Kit $99
Wired $169

Exciter Input Range	Antenna Output
28-30	144–146
28–29	145–146
28–30	50–52
27–27.4	144–144.4
28–30	220–222*
50–54	220–224
144–146	50–52
50–54	144–148
144–146	28–30
28–30	432–434
28–30	435–437
50–54	432–436
61.25	439.25
144–148	432–436*

*Add $20 for 2M input

VHF & UHF LINEAR AMPLIFIERS. Use with above. Power levels from 10 to 45 Watts. Several models, kits from $78.

LOW-NOISE PREAMPS

INPUT
OUTPUT
HAMTRONICS
RECEIVER PREAMPLIFIER

Hamtronics Breaks the Price Barrier!

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No Need to Pay $80 to $125 for a GaAs FET Preamp.

FEATURES:

- Very Low Noise: 0.7 dB VHF, 0.8 dB UHF
- High Gain: 18 to 28 dB, Depending on Freq.
- Wide Dynamic Range for Overload Resistance
- Latest Dual-gate GaAs FET, Very Stable

MODEL	TUNES RANGE	PRICE
LNG-28	26-30 MHz	$49
LNG-50	46-56 MHz	$49
LNG-144	137-150 MHz	$49
LNG-160	150-172 MHz	$49
LNG-220	210-230 MHz	$49
LNG-432	400-470 MHz	$49
LNG-800	800-960 MHz	$49

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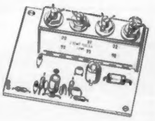
Low-noise preamps with helical resonators reduce intermod and cross-band interference in critical applications. 12 dB gain.



Model	Tuning Range	Price
HRA-144	143-150 MHz	$49
HRA-220	213-233 MHz	$49
HRA-432	420-450 MHz	$59
HRA-( )	150-174 MHz	$54
HRA-( )	450-470 MHz	$64

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- **MO-202 FSK DATA MODULATOR.** Run up to 1200 baud digital or packet radio signals through any FM transmitter. Automatically keys transmitter and provides handshakes. 1200/2200 Hz tones. Kit only $45.
- **DE-202 FSK DATA DEMODULATOR.** Use with any FM receiver to detect packet radio or other digital data in "202" modem format. Provides audio conditioning and handshakes. Kit only $38.
- **COR-2 KIT** With audio mixer, local speaker amplifier, tail & time-out timers. Only $38.
- **COR-3 KIT** as above, but with "courtesy beep". Only $58.
- **CWID KITS** 158 bits, easily field programmable, clean audio. Kit only $68.
- **A16 RF TIGHT BOX** Deep drawn alum. case with tight cover and no seams. 7 × 8 × 2 inches. Designed especially for repeaters. $20.
- **DTMF DECODER/CONTROLLER KITS.** Control 2 separate on/off functions with touchtones®, e.g., repeater and autopatch. Use with main or aux. receiver or with Autopatch. Only $90
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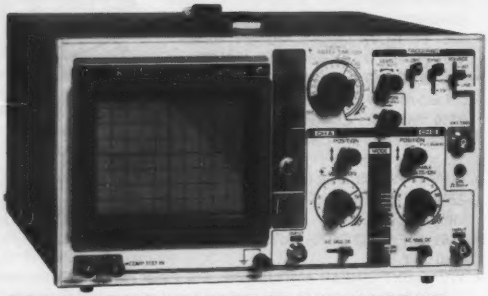


20 MHz DUAL TRACE OSCILLOSCOPE

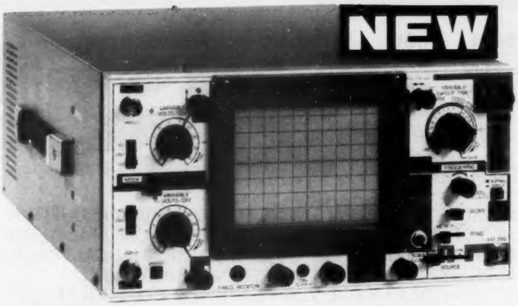
Unsurpassed quality at an unbeatable price, the Ramsey oscilloscope compares to others costing hundreds more. Features include a component testing circuit for resistor, capacitor, digital circuit and diode testing. • TV video sync filter • wide bandwidth & high sensitivity • internal graticule • front panel trace rotator • Z axis • high sensitivity x-y mode • regulated power supply • built-in calibrator • rock solid triggering

$399⁹⁵*

high quality hook on probes included

*** USA—Add $10.00 per unit for postage, overseas orders add 15% of total order for Insured Surface Mail**

NEW



45 MHz DUAL SWEEP OSCILLOSCOPE

The Ramsey 625 is a dual time base, delayed sweep unit that includes a built-in signal delay line to permit clear viewing during very short rise times of high frequency waveforms. Other features include; variable trigger holdoff • 20 calibrated sweep time ranges from 0.5 s/div to 0.2 μS/div. • fully adjustable sweep time • X5 sweep magnification • five trigger sources; CH1, CH2, LINE EXTernal and INTernal (V mode) • front panel x-y operation, Z axis input • sum difference of CH1, and CH2 waveforms displayed as single trace • sweep gate and sweep output • auto focus • single sweep

$799.⁹⁵*

high quality hook on probes included

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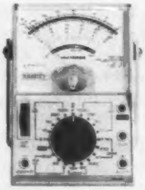

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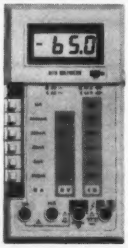
Compact and reliable, designed to service a wide variety of equipment. Features include • mirror back scale • double-jeweled precision moving coil • double overload protection • an ideal low cost unit for the beginner or as a spare back-up unit.

$19⁹⁵ **test leads and battery included**

NEW RAMSEY 1200 VOM MULTITESTER

Check transistors, diodes and LEDs with this professional quality meter. Other features include; decibel scale • 20K volt metering system • 3½" mirrored scale • polarity switch • 20 measuring ranges • safety probes • high impact plastic case

$24⁹⁵ **test leads and battery included**



RAMSEY D-3100 DIGITAL MULTIMETER

Reliable, accurate digital measurements at an amazingly low cost • in-line color coded push buttons, speeds range selection • abs plastic tilt stand • recessed input jacks • overload protection on all ranges • 3½ digit LCD display with auto zero, auto polarity & low BAT. indicator

$49⁹⁵ **test leads and battery included**

CT-70 COUNTER

CT-70 7 DIGIT 525 MHz COUNTER

Lab quality at a breakthrough price. Features • 3 frequency ranges each with pre amp • dual selectable gate times • gate activity indicator • 50mV @ 150 MHz typical sensitivity • wide frequency range • 1 ppm accuracy

$119⁹⁵ **wired includes AC adapter**

CT-70 kit	$99.95
BP-4 nicad pack	8.95

CT-90 COUNTER

CT-90 9 DIGIT 600 MHz COUNTER

The most versatile for less than $300. Features 3 selectable gate times • 9 digits • gate indicator • display hold • 25mV @ 150 MHz typical sensitivity • 10 MHz timebase for WWV calibration • 1 ppm accuracy

$149⁹⁵ **wired includes AC adapter**

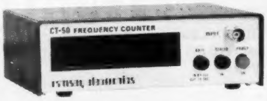
CT-90 kit	$129.95
OV-1 0.1 PPM oven timebase	59.95
BP-4 nicad pack	8.95

CT-125 9 DIGIT 1.2 GHz COUNTER

A 9 digit counter that will outperform units costing hundreds more. • gate indicator • 24mV @ 150 MHz typical sensitivity • 9 digit display • 1 ppm accuracy • display hold • dual inputs with preamps

$169⁹⁵ **wired includes AC adapter**

BP-4 nicad pack	8.95



CT-50 8 DIGIT 600 MHz COUNTER

A versatile lab bench counter with optional receive frequency adapter, which turns the CT-50 into a digital readout for most any receiver • 25 mV @ 150 MHz typical sensitivity • 8 digit display • 1 ppm accuracy

$169⁹⁵ **wired**

CT-50 kit	$139.95
RA-1 receiver adapter kit	14.95

DM-700 DIGITAL MULTIMETER

Professional quality at a hobbyist price. Features include 26 different ranges and 5 functions • 3½ digit, ½ inch LED display • automatic decimal placement • automatic polarity

$119⁹⁵ **wired includes AC adapter**

DM-700 kit	$99.95
MP-1 probe set	4.95

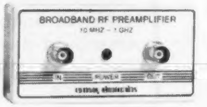
PS-2 AUDIO MULTIPLIER

PS-2 AUDIO MULTIPLIER

The PS-2 is handy for high resolution audio resolution measurements, multiplies UP in frequency • great for PL tone measurements • multiplies by 10 or 100 • 0.01 Hz resolution & built-in signal preamp/conditioner

$49⁹⁵ **wired**

PS-2 kit	$39.95



PR-2 COUNTER PREAMP

The PR-2 is ideal for measuring weak signals from 10 to 1,000 MHz • flat 25 db gain • BNC connectors • great for shifting RF • ideal receiver/TV preamp

$44⁹⁵ **wired includes AC adapter**

PR-2 kit	$34.95

PS-1B
600 MHZ PRESCALER
POWER
ON

PS-1B 600 MHz PRESCALER

Extends the range of your present counter to 600 MHz • 2 stage preamp • divide by 10 circuitry • sensitivity: 25mV @ 150 MHz • BNC connectors • drives any counter

$59⁹⁵ **wired includes AC adapter**

PS-1B kit	$49.95

ACCESSORIES FOR RAMSEY COUNTERS

Telescopic whip antenna—BNC plug	$ 8.95
High impedance probe, light loading	16.95
Low pass probe, audio use	16.95
Direct probe, general purpose use	13.95
Tilt bail, for CT-70, 90, 125	3.95

VISA MasterCard

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TELEX 466735 RAMSEY CI

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RAMSEY

RAMSEY ELECTRONICS, INC.
2575 Baird Rd.
Penfield, N.Y. 14626

TUBES

TYPE	PRICE
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2E26	7.95
2K28	200.00
3-500Z	102.00
3-1000Z/8164	400.00
3B28/866A	9.50
3CX400U7/8961	255.00
3CX1000A7/8283	526.00
3CX3000F1/8239	567.00
3CW30000H7	1700.00
3X2500A3	473.00
3X3000F1	567.00
4-65A/8165	69.00
4-125A/4D21	79.00
4-250A/5D22	98.00
4-400A/8438	98.00
4-400B/7527	110.00
4-400C/6775	110.00
4-1000A/8166	444.00
4CX250B/7203	54.00
4CX250FG/8621	75.00
4CX250K/8245	125.00
4CX250R/7580W	90.00
4CX300A/8167	170.00
4CX350A/8321	110.00
4CX350F/8322	115.00
4CX350FJ/8904	140.00
4CX600J/8809	835.00
4CX1000A/8168	242.50*
4CX1000A/8168	485.00
4CX1500B/8660	555.00
4CX5000A/8170	1100.00
4CX10000D/8171	1255.00
4CX15000A/8281	1500.00
4CW800F	710.00
4D32	240.00
4E27A/5-125B	240.00
4PR60A	200.00
4PR60B	345.00
4PR65A/8187	175.00
4PR1000A/8189	590.00
4X150A/7034	60.00
4X150D/7609	95.00
4X250B	45.00
4X250F	45.00
4X500A	412.00
5CX1500A	660.00
KT88	27.50
416B	45.00
416C	62.50
572B/T160L	49.95
592/3-200A3	211.00
807	8.50
811A	15.00
812A	29.00
813	50.00
1182/4600A	$500.00
4600A	500.00
4624	310.00
4657	84.00
4662	100.00
4665	500.00
4687	P.O.R.
5675	42.00
5721	250.00
5768	125.00
5819	119.00
5836	232.50
5837	232.50
5861	140.00
5867A	185.00
5868/AX9902	270.00
5876/A	42.00
5881/6L6	8.00
5893	60.00
5894/A	54.00
5894B/8737	54.00
5946	395.00
6083/AZ9909	95.00
6146/6146A	8.50
6146B/8298	10.50
6146W/7212	17.95
6156	110.00
6159	13.85
6159B	23.50
6161	325.00
6280	42.50
6291	180.00
6293	24.00
6326	P.O.R.
6360/A	5.75
6399	540.00
6550A	10.00
6883B/8032A/8552	10.00
6897	160.00
6907	79.00
6922/6DJ8	5.00
6939	22.00
7094	250.00
7117	38.50
7203	P.O.R.
7211	100.00
7213	300.00*
7214	300.00*
7271	135.00
7289/2C39	34.00
7325	P.O.R.
7360	13.50
7377	85.00
7408	2.50
7609	95.00
7735	36.00
ML7815AL	$ 60.00
7843	107.00
7854	130.00
ML7855KAL	125.00
7984	14.95
8072	84.00
8106	5.00
8117A	225.00
8121	110.00
8122	110.00
8134	470.00
8156	12.00
8233	60.00
8236	35.00
8295/PL172	500.00
8458	35.00
8462	130.00
8505A	95.00
8533W	136.00
8560/A	75.00
8560AS	100.00
8608	38.00
8624	100.00
8637	70.00
8643	83.00
8647	168.00
8683	95.00
8877	465.00
8908	13.00
8950	13.00
8930	137.00
6L6 Metal	25.00
6L6GC	5.03
6CA7/EL34	5.38
6CL6	3.50
6DJ8	2.50
6DQ5	6.58
6GF5	5.85
6GJ5A	6.20
6GK6	6.00
6HB5	6.00
6HF5	8.73
6JG6A	6.28
6JM6	6.00
6JN6	6.00
6JS6C	7.25
6KN6	5.05
6KD6	8.25
6LF6	7.00
6LQ6 G.E.	7.00
6LQ6/6MJ6 Sylvania	9.00
6ME6	8.90
12AT7	3.50
12AX7	3.00
12BY7	5.00
12JB6A	6.50

NOTE * = USED TUBE

NOTE P.O.R. = PRICE ON REQUEST

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"FILTERS"

COLLINS Mechanical Filter #526-9724-010 MODEL F455Z32F

455KHZ at 3.2KHz wide. May be other models but equivalent. May be used or new. $15.99

ATLAS Crystal Filters

5.595-2.7/8/LSB, 5.595-2.7/LSB
8 pole 2.7KHz wide Upper sideband. Impedence 800ohms 15pf In/800ohms 0pf out. 19.99

5.595-2.7/8/U, 5.595-2.7/USB
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5.595-.500/4, 5.595-.500/4/CW
4 pole 500 cycles wide CW. Impedance 800ohms 15pf In/800ohms 0pf out. 19.99

9.0USB/CW
6 pole 2.7KHz wide at 6dB. Impedance 680ohms 7pf In/300ohms 8pf out. CW-1599Hz 19.99

KOKUSAI ELECTRIC CO. Mechanical Filter #MF-455-ZL/ZU-21H

455KHz at Center Frequency of 453.5KC. Carrier Frequency of 455KHz 2.36KC Bandwidth.
Upper sideband. (ZU) 19.99
Lower sideband. (ZL) 19.99

* * *

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NIKKO	FX-07800C	7.8MHz	$10.00
TEW	FEC-103-2	10.6935MHz	10.00
SDK	SCH-113A	11.2735MHz	10.00
TAMA	TF-31H250	CF 3179.3KHz	19.99
TYCO/CD	001019880	10.7MHz 2pole 15KHz bandwidth	5.00
MOTOROLA	4884863B01	11.7MHz 2pole 15KHz bandwidth	5.00
PTI	5350C	12MHz 2pole 15KHz bandwidth	5.00
PTI	5426C	21.4MHz 2pole 15KHz bandwidth	5.00
PTI	1479	10.7MHz 8pole bandwidth 7.5KHz at 3dB, 5KHz at 6dB	20.00
COMTECH	A10300	45MHz 2pole 15KHz bandwidth	6.00
FRC	ERXF-15700	20.6MHz 36KHz wide	10.00
FILTECH	2131	CF 7.825MHz	10.00

* * *

CERAMIC FILTERS

AXEL	4F449	12.6KC Bandpass Filter 3dB bandwidth 1.6KHz from 11.8-13.4KHz	10.00
CLEVITE	TO-01A	455KHz+-2KHz bandwidth 4-7% at 3dB	5.00
	TCF4-12D36A	455KHz+-1KHz bandwidth 6dB min 12KHz, 60dB max 36KHz	10.00
MURATA	BFB455B	455KHz	2.50
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	CFM455E	455KHz +-5.5KHz at 3dB , +-8KHz at 6dB , +-16KHz at 50dB	6.65
	CFM455D	455KHz +-7KHz at 3dB , +-10KHz at 6dB , +-20KHz at 50dB	6.65
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	CFW455D	455KHz +-10KHz at 6dB , +-20KHz at 40dB	2.90
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	SFB455D	455KHz	2.50
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	LF-B6/CFU455H	455KHz +-1KHz	2.90
	LF-B8	455KHz	2.90
	LF-C18	455KHz	10.00
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2N2949	15.50	2N5947	9.20	3729685-2 RCA	75.00	BLY92	13.30
2N3118	5.00	2N6080	6.00	3729701-2 RCA	50.00	BLY94C	45.00
2N3119	4.00	2N6081	7.00	3753883 RCA	50.00	BLY351	10.00
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2N3288	4.40	2N6084	12.00	2SC568	2.50	C25-28	57.00
2N3309	4.85	2N6094	11.00	2SC703	36.00	C4005	2.50
2N3375	17.10	2N6095	12.00	2SC756A	7.50	CD1659	20.00
2N3478	2.13	2N6096	16.10	2SC781	2.80	CD1899	20.00
2N3553	1.55	2N6097	20.70	2SC1018	1.00	CD1920	10.00
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2N3632	15.50	2N6136	21.85	2SC1070	2.50	CD2545	24.00
2N3733	11.00	2N6166	40.24	2SC1216	2.50	CD2664A	16.00
2N3818	5.00	2N6267	142.00	2SC1239	2.50	CD3167	92.70
2N3866	1.30	2N6304	1.50	2SC1251	24.00	CD3353	95.00
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2N3924	3.35	2N6603	13.50	2SC1678	2.00	CM40-28	56.90
2N3926	16.10	2N6604	13.50	2SC1729	32.40	CME50-12	30.00
2N3927	17.25	2N6679	44.00	2SC1760	1.50	CTC2001	42.00
2N3948	1.75	2N6680	80.00	2SC1909	4.00	CTC2005	55.00
2N3950	25.00	021-1	15.00	2SC1945	10.00	CTC3005	70.00
2N3959	3.85	01-80703T4	65.00	2SC1946	40.00	CTC3460	20.00
2N4012	11.00	35C05	15.00	2SC1947	10.00	DV2820S	25.00
2N4037	2.00	102-1	28.00	2SC1970	2.50	DXL1003P70	22.00
2N4041	14.00	103-1	28.00	2SC1974	4.00	DXL2001P70	19.00
2N4072	1.80	103-2	28.00	2SC2166	5.50	DXL2002P70	14.00
2N4080	4.53	104P1	18.00	2SC2237	32.00	DXL3501AP100F	47.00
2N4127	21.00	163P1	10.00	2SC2695	47.00	EFJ4015	12.00
2N4416	2.25	181-3	15.00	A2X1698	POR	EFJ4017	24.00
2N4427	1.25	210-2	10.00	A3-12	14.45	EFJ4021	24.00
2N4428	1.85	269-1	18.00	A50-12	24.00	EFJ4026	35.00
2N4430	11.80	281-1	15.00	A209	10.00	EN15745	20.00
2N4927	3.90	282-1	30.00	A283	6.00	FJ9540	16.00
2N4957	3.45	482	7.50	A283B	6.00	FSX52WF	58.00
2N4959	2.30	564-1	25.00	A1610	19.00	G65739	25.00
2N5016	18.40	698-3	15.00	AF102	2.50	G65386	25.00
2N5026	15.00	703-1	15.00	AFY12	2.50	GM0290A	2.50
2N5070	18.40	704	4.00	AR7115	20.00	HEP76	4.95
2N5090	13.80	709-2	11.00	AT41435-5	6.35	HEPS3002	11.40
2N5108	3.45	711	4.00	B2-8Z	10.70	HEPS3003	30.00
2N5109	1.70	733-2	15.00	B3-12	10.85	HEPS3005	10.00
2N5160	3.45	798-2	25.00	B12-12	15.70	HEPS3006	19.90
2N5177	21.62	3421	28.00	BAL0204125	152.95	HEPS3007	25.00
2N5179	1.04	3683P1	15.00	BF25-35	56.25	HEPS3010	11.34
2N5216	56.00	3992	25.00	B40-12	19.25	HF8003	10.00
2N5470	75.00	4164P1	15.00	B70-12	55.00	HFET2204	112.00
2N5583	3.45	4243P1	28.00	BF272A	2.50	HP35821	38.00
2N5589	9.77	4340P3	18.00	BFQ85	2.50	HP35826B	32.00
2N5590	10.92	4387P1	27.50	BFR21	2.50	HP35826E	32.00
2N5591	13.80	7104-1	28.00	BFR90	1.00	HP35831E	30.00
2N5596	99.00	7249-2	10.50	BFR91	1.65	HP35832E	50.00
2N5636	12.00	7283-1	37.50	BFR99	2.50	HP35833E	50.00
2N5637	15.50	7536-1	30.00	BFT12	2.50	HP35859E	75.00
2N5641	12.42	7794-1	10.50	BFW16A	2.50	HP35866E	44.00
2N5642	14.03	7795	15.00	BFW17	2.50	HXTR2101	44.00
2N5643	25.50	7795-1	15.00	BFW92	1.50	HXTR3101	7.00
2N5645	13.80	7796-1	24.00	BFX44	2.50	HXTR5101	31.00
2N5646	20.70	7797-1	36.00	BFX48	2.50	HXTR6104	68.00
2N5651	11.05	40081 RCA	5.00	BFX65	2.50	HXTR6105	31.00
2N5691	18.00	40279 RCA	10.00	BFX84	2.50	HXTR6106	33.00
2N5764	27.00	40280 RCA	4.62	BFX85	2.50	J310	1.00
2N5836	3.45	40281 RCA	10.00	BFX86	2.50	J02000	10.00
2N5842	8.45	40282 RCA	20.00	BFX89	1.00	J02001	25.00
2N5847	19.90	40290 RCA	2.80	BFY11	2.50	J04045	24.00
2N5849	20.00	40292 RCA	13.05	BFY18	2.50	KD5522	25.00
2N5913	3.25	40294 RCA	2.50	BFY19	2.50	KJ5522	25.00
2N5916	36.00	40341 RCA	21.00	BFY39	2.50	M1106	13.75

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M1107	$16.75	MRF458	$20.70	NE02160ER	$100.00	SD1009	$15.00
M1131	5.15	MRF464	25.30	NE021350	5.30	SD1009-2	15.00
M1132	7.25	MRF466	18.97	NE13783	61.00	SD1012	10.00
M1134	13.40	MRF472	1.50	NE21889	43.00	SD1012-3	10.00
M9116	29.10	MRF475	3.10	NE57835	5.70	SD1012-5	10.00
M9579	6.00	MRF476	3.16	NE64360ER-A	100.00	SD1013	10.00
M9580	7.95	MRF477	20.00	NE64480 (B)	94.00	SD1013-3	10.00
M9587	7.00	MRF479	8.05	NE73436	2.50	SD1013-7	10.00
M9588	5.20	MRF492	23.00	NE77362ER	100.00	SD1016	15.00
M9622	5.95	MRF502	1.04	NE98260ER	100.00	SD1016-5	15.00
M9623	7.95	MRF503	6.00	PRT8637	25.00	SD1018-4	13.00
M9624	9.95	MRF504	7.00	PT3127A	5.00	SD1018-6	13.00
M9625	15.95	MRF509	5.00	PT3127B	5.00	SD1018-7	13.00
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M9740	27.90	MRF515	2.00	PT3127D	20.00	SD1020-5	10.00
M9741	27.90	MRF517	2.00	PT3127E	20.00	SD1028	15.00
M9755	16.00	MRF525	3.45	PT3190	20.00	SD1030	12.00
M9780	5.50	MRF559	1.76	PT3194	20.00	SD1030-2	12.00
M9827	11.00	MRF587	11.00	PT3195	20.00	SD1040	5.00
M9848	35.00	MRF605	20.00	PT3537	7.80	SD1040-2	20.00
M9850	13.50	MRF618	25.00	PT4166E	20.00	SD1040-4	10.00
M9851	20.00	MRF626	12.00	PT4176D	25.00	SD1040-6	5.00
M9860	8.25	MRF628	8.65	PT4186B	5.00	SD1043	12.00
M9887	2.80	MRF629	3.45	PT4209	25.00	SD1043-1	10.00
M9908	6.95	MRF641	25.30	PT4209C/5645	25.00	SD1045	3.75
M9965	12.00	MRF644	27.60	PT4556	24.60	SD1049-1	2.00
MM1500	25.00	MRF646	29.90	PT4570	7.50	SD1053	4.00
MM1550	10.00	MRF648	33.35	PT4577	20.00	SD1057	10.00
MM1552	50.00	MRF816	15.00	PT4590	5.00	SD1065	4.75
MM1553	50.00	MRF823	20.00	PT4612	20.00	SD1068	15.00
MM1607	8.45	MRF846	44.85	PT4628	20.00	SD1074-2	18.00
MM1614	10.00	MRF892	35.50	PT4640	20.00	SD1074-4	28.00
MM1810	15.00	MRF894	46.00	PT4642	20.00	SD1074-5	28.00
MM1810	15.00	MRF901 3 Lead	1.00	PT5632	4.70	SD1076	18.50
MM1943	1.80	MRF901 4 Lead	2.00	PT5749	25.00	SD1077	4.00
MM2608	5.00	MRF902/2N6603JAN	15.00	PT6612	25.00	SD1077-4	4.00
MM3375A	17.10	MRF902B	18.40	PT6619	20.00	SD1077-6	4.00
MM4429	10.00	MRF904	2.30	PT6708	25.00	SD1078-6	24.00
MM8000	1.15	MRF905	2.55	PT6709	25.00	SD1080-7	7.50
MM8006	2.30	MRF911	2.50	PT6720	25.00	SD1080-8	6.00
MM8011	25.00	MRF965	2.55	PT8510	15.00	SD1080-9	3.00
MPSU31	1.01	MRF966	3.55	PT8524	25.00	SD1084	8.00
MRA2023-1.5	42.50	MRF1000MA	32.77	PT8609	25.00	SD1087	15.00
MRF134	10.50	MRF1004M	31.05	PT8633	25.00	SD1088	22.00
MRF136	16.00	MRF2001	41.74	PT8639	25.00	SD1088-8	22.00
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MRF212	16.10	MRF8004	2.10	PT8708	20.00	SD1094	15.00
MRF221	10.00	MSC1720-12	225.00	PT8709	20.00	SD1095	15.00
MRF223	13.00	MSC1821-3	125.00	PT8727	29.00	SD1098-1	30.00
MRF224	13.50	MSC1821-10	225.00	PT8731	25.00	SD1100	5.00
MRF227	3.45	MSC2001	30.00	PT8742	19.10	SD1109	18.00
MRF230	2.00	MSC2010	93.00	PT8787	25.00	SD1115-2	7.50
MRF231	10.00	MSC2223-10	245.00	PT8828	25.00	SD1115-3	7.50
MRF232	12.07	MSC2302	POR	PT9700	25.00	SD1115-7	2.10
MRF237	3.15	MSC3000	35.00	PT9702	25.00	SD1116	5.00
MRF238	13.80	MSC3001	38.00	PT9783	16.50	SD1118	22.00
MRF239	17.25	MSC72002	POR	PT9784	32.70	SD1119	5.00
MRF245	35.65	MSC73001	POR	PT9790	56.00	SD1124	50.00
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MRF428	63.00	MSC83303	POR	SCA3523	5.00	SD1144	4.00
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MRF449/A	12.65	MT4150	14.40	SD445	5.00	SD1146	15.00
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SD1219-8	15.00	SD1365-1	2.50	SD1484-5	1.50	SRF2281	5.00	SD1278-1	13.75	SD1430	12.00	SF4557	25.00	TA8562	15.00
SD1220	8.00	SD1365-5	2.50	SD1484-6	1.50	SRF2371	15.00	SD1278-5	13.75	SD1430-2	18.00	SK3048	5.00	TA8563	15.00
SD1220-1	9.50	SD1375	7.50	SD1484-7	1.50	SRF2347	50.00	SD1279-1	18.00	SD1434	28.00	SL501-59	15.00	TA8564	15.00
SD1220-9	8.00	SD1375-6	7.50	SD1488	22.85	SRF2356	38.00	SD1279-3	18.00	SD1434-5	28.00	SL501-173	15.00	TA8894	15.00
SD1222-8	16.00	SD1379	15.00	SD1488-1	28.00	SRF2378	16.00	SD1281-2	8.00	SD1434-9	28.00	SM7714	5.00	TIS189	3.55
SD1222-11	7.50	SD1380-1	1.00	SD1488-7	27.00	SRF2572	25.00	SD1283	10.00	SD1438	26.00	SRF112	15.00	TP312	2.50
SD1224-10	18.00	SD1380-3	1.00	SD1488-8	28.00	SRF2584	40.00	SD1283-2	10.60	SD1441	56.00	SRF395	50.00	TP1014	5.00
SD1225	18.00	SD1380-7	1.00	SD1499-1	36.00	SRF2597	25.00	SD1283-3	10.00	SD1442	15.00	SRF750	36.00	TP1028	15.00
SD1225-1	15.00	SD1405	21.00	SD1511H3	75.00	SRF2741	40.00	SD1283-4	10.00	SD1444	3.25	SRF769H	20.00	TRW3	5.00
SD1229-7	10.95	SD1408	25.00	SD1520-2	18.00	SRF2747	40.00	SD1289-1	15.00	SD1444-8	3.25	SRF887K3	2.50	TXVF2201/HP	450.00
SD1229-16	10.95	SD1409	18.00	SD1522-4	33.00	SRF2767H	40.00	SD1290-4	15.00	SD1444-9	3.25	SRF989K	15.00	V222-2	25.00
SD1232	4.00	SD1410	18.00	SD1528-1	24.00	SRF2821	25.00	SD1290-7	15.00	SD1446	4.03	SRF1005	50.00	V4101E	20.00
SD1240-8	15.00	SD1410-3	21.00	SD1528-3	36.00	SRF2822/2N6603	13.50	SD1300	1.25	SD1450-1	28.00	SRF1018	5.00	V415	5.00
SD1244-1	14.00	SD1410-6	21.00	SD1530-2	38.00	SRF2857	20.00	SD1301-7	3.00	SD1451	15.00	SRF1074	50.00		

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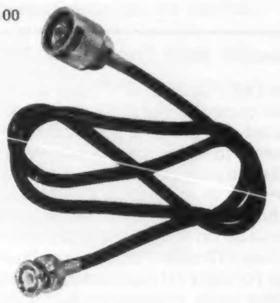

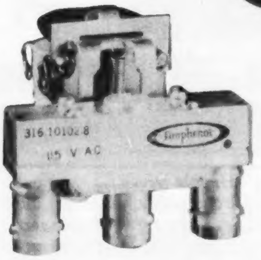

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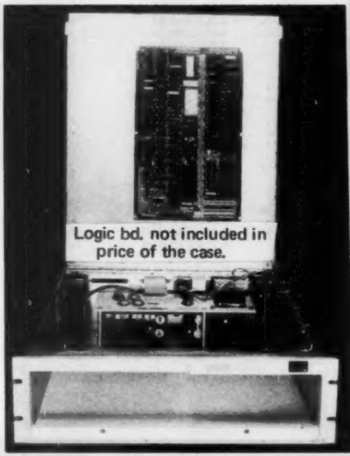
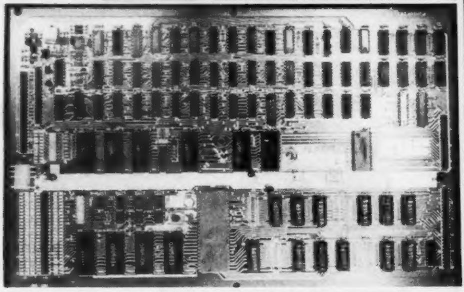


Logic bd. not included in price of the case.

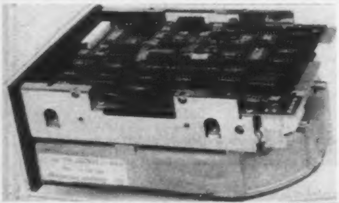
Dual 8" F. D. D. Case by SMS w/ POWER ONE Power Supply & Cooling Fans

We were very fortunate to find these beautifully designed & constructed rack mount disc drive cases in the surplus field. These cases were made for Scientific Micro Systems for their FT Series of equipment. They are manufactured from heavy guage steel w/ a cast metal designer bezel. They were designed to house 2 8" floppy or hard drives. We offer you the case with the following components & features: hinged cover with restraining cable for simplified servicing of the interior components, 2 muffin fans for assured cool operation, studs for mounting the controller card listed below, and a heavy duty Power One power supply (their model no. CP 281A). The outputs of the power supply are as follows: +5 vdc 11 amps, +24 vdc 3.5 amps, +12 vdc .25 amps, -12 vdc .25 amps, & –5 vdc .25 amps. The input to the power supply is 115/230 vac 50/60 Hz. and is both filtered and fused. This assembly must have originally sold for well over $300.00 each ! Only 25 on hand, so order early or be left out on this super bargain ! Shpg. wt. 38 lb. SPL-479-35 $135.00 each

Scientific Micro Systems IBM 3740 Compatible 8" FDD Controller Card



The SMS FD 0502 8" floppy disc drive controller is a complete preprogrammed controller for single or double density recording on either single or dual headed disc drives. It performs control functions required to transfer data between 1 to 4 drives and a host system, performs all formatting functions required to read and write data and utilizes both IBM single and double density standards to achieve up to 630 Kilobytes of storage per disc surface. Some features are: programmable sector size, 128, 256, 512, or 1024 bytes, jumper selectable drive type, block transfer mode, sector buffer, overlapped head seek, on board General Purpose Host Interface with asynchronous 19 TTL signal lines for eight bit host system and input of only 5 vdc 6 amps. This board provides a direct interface to the following drives: Shugart 800 –2/850, Pertec 511, Memorex 550/552, MFE 751B, Qume Data Trak and similiar drives. These boards were removed from the above cabinets which were in service prior to our reception of them. The manufacturers price on these IBM compatible boards is currently $900.00 each. These boards all appear to be in excellent condition. If more information is needed, please call us. Shpg. wt. 3 lb. SPL 480 $150.00



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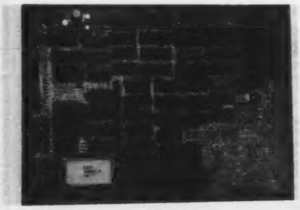
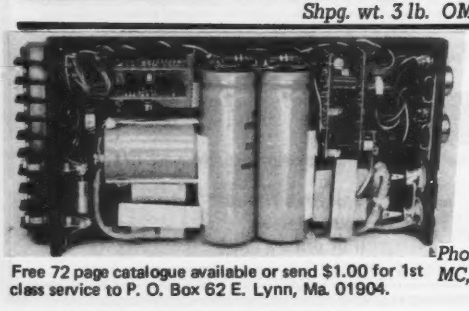
The Seagate Technology ST 506 hard disc drive utilizes proven Winchester teacnology for reliable storage of up to 5 megabytes of formatted data. Some features of this very popular drive are: 5 megabit/second data transfer rate, simple floppy like interface, high speed band actuator & stepper head positioning, requires only +5 & +12 vdc, and same physical size and mounting paramters as a mini floppy drive. This Shugart compatible drive is the same as used on many home personal computers. Each drive is checked out prior to shipment. Comes with data. Only a few on hand, so order early.
Shpg. wt. 8 lb. ST-506 $225.00



5 ¼" HARD DRIVE CONTROLLER CARD

Finally, affordable, intelligent disc drive controllers are available at low, low surplus prices. The OMTI 20C controller boards we offer are unused, late style, surplus from a now defunct system house. OMTI is a division of Scientific Micro Systems. These boards will handle up to (2) 5¼ inch Winchester type hard drives that utilize a standard 34 pin SASI interface. Perfect for using with the above Seagate ST 506 drive, or other hard drives from 5 megabytes of storage on up. The controllers have buffered slew/seek modes, overlapped seeks, auto seek & verify, extensive fault detection, auto head & cylinder switching, full sector buffering, 256/512 bytes/sector, 33 or 18 sectors/track (jumper selectable), programmable disc parameters and much more. The board runs on +5 vdc & +12 vdc.. We supply users manual & pinout data. Guaranteed O. K..
Shpg. wt. 3 lb. OMTI 20 C $150.00 each 2/$275.00 Qty. pricing available.



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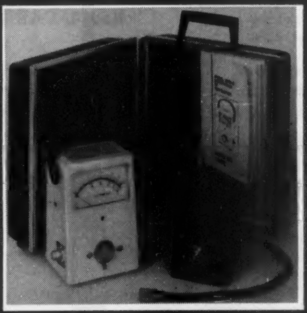
The RF Wattmeter Model 81000-A from Coaxial Dynamics, Inc. does more than provide accurate rf measurements. Testing of transmission lines, antennas, connectors, filters and related components can reveal unknown problems and assure optimum equipment performance.

The 81000-AK Wattkit features this easy-to-read RF Wattmeter (pictured here), with its optional carrying case and an array of elements and accessories. Coaxial Dynamics elements can be purchased separately for use in other manufacturer's Wattmeters. For more information on the 81000-A Wattmeter or any of the complete line of Coaxial Dynamics RF products and OEM components please contact Coaxial Dynamics, Inc.



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NEW PRODUCTS

θ-777 COMPUTER INTERFACE

Amateur-Wholesale Electronics has announced the new Tono θ-777 computer-interface terminal, featuring RTTY, AMTOR modes ARQ, FEC, and SEL-FEC, ASCII, and CW, at any speed and any shift.

The θ-777 is a self-contained unit including software that allows reception and transmission with any computer or terminal that has RS-232 or TTL I/O. The θ-777 automatically decodes signals and displays the mode, speed, and polarity on the CRT. A bar-graph tuning indicator allows precise centering of received signals.

In Baudot or ASCII mode, communication speed can be set from 12 to 200 baud using the modem, or 12 to 600 baud using TTL levels. Morse speed can be varied from 5 to 100 wpm in 1-wpm increments and is tracked automatically during receive.

Other features of the θ-777 include 15 channels of message memory, plus a 768-character type-ahead buffer, manual/automatic PTT switching, selective calling, provision for tape-recorder backup memory, automatic carriage return and line feed, CW random generator for code practice, variable CW weight, test messages (RY and QBF), bit inversion for RTTY reception and transmission, diddle, echo, full CRT function display, audio monitor, mark-only or space-only reception, crystal-controlled AFSK modulator, anti-noise feature, and more. The instruction manual provides sample computer terminal programs for use with NEC or Apple II personal computers.

The θ-777 operates from a power supply of 11 to 14 volts dc. The unit measures approximately 2.5 inches high, 9 inches wide, and 10 inches deep. For more information, please contact *Amateur-Wholesale Electronics, Inc., 8817 SW 129 Terrace, Miami FL 33176.*

ICOM 3200A DUAL-BANDER

ICOM has announced the IC-3200A, a 25-Watt VHF/UHF transceiver. The IC-3200A is simple to use and offers extended 2-meter frequency coverage (140–150 MHz), ten MHz of coverage in the 70-centimeter band (440–450 MHz), and 5-kHz-step fully-programmable offsets for MAS and CAP repeater operation. The IC-3200A also features ten tunable memories, multimode scanning, and a built-in duplexer for single-antenna operation. The rig comes with an IC-HM14 scanning microphone, a dc power cord, and a mobile mounting bracket.

For complete details, contact *ICOM America, Inc., 2380 116th Avenue NE, PO Box C-9029, Bellevue WA 98009-9029.*

IC-3200A
VFO A
TONE
145.52
9

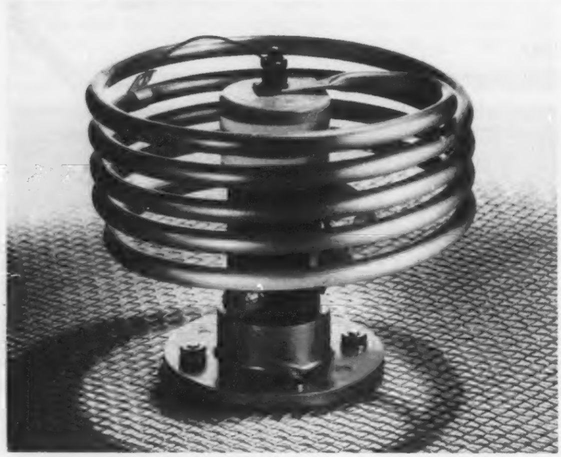
The ICOM 3200A dual-bander.

COM-RAD UNTENNA

Com-Rad Industries has expanded their line of low-profile Untennas with the introduction of their CR109A helical. Weighing only three pounds and standing a mere 5-3/4 inches tall, the CR109A will handle up to 200 Watts of rf from 27 to 85 MHz. A tuning slide allows easy frequency selection. Untennas are constructed of durable stainless steel, aluminum, phosphor bronze, and chrome plate and use nonmetallic support structures.

Also available from Com-Rad is a protective radome. The radome is made of high-impact, UV-resistant plastic and may be painted with any nonmetallic pigment.

For more information, contact *Com-Rad Industries, 25 Imson Street, Buffalo NY 14210; (716)-823-0331.*



The Com-Rad CR109A helical antenna.

LARSEN HALF-WAVE UHF ANTENNA

Larsen Antenna's new KD 14-450-HW antenna is a full half-wave UHF antenna for portables which interfaces with any portable using a BNC connector.

The KD 14-450-HW is an excellent antenna for any UHF application requiring maximum performance. Because of its inherent resonance, it may be easily remoted via a coaxial line from the portable. The overall whip length is 12", and the impedance transformer at the base of the whip is 3.25" long.

For more information, contact *Larsen Electronics, PO Box 1799, Vancouver WA 98668; (206)-573-2722.*

Larsen's half-wave UHF whip.

HAL MULTIMODE TUNING AID

Hal Communications has announced their new SPT-1 Spectra-Tune multimode tuning indicator, which allows perfect tuning of CW, RTTY, FAX, and SSTV signals. A calibrated 40-segment LED bar graph gives a visual indication of RTTY shifts and provides an indication of which direction to tune the vfo for zero beat. The display is also useful in adjusting filters and passband-tuning parameters. An audio input and a 12-V-dc supply are the only connections required for operation.

For complete information about the SPT-1, contact *HAL Communications Corp., PO Box 365, Urbana IL 61801.*

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170
425
850
CW
BLK
W/H
FAX/SSTV

The Hal SPT-1 Spectra-Tune multimode tuning indicator.

JENSEN COMPUTER KIT

The JTK-76 Computer Systems Maintenance Kit from Jensen Tools contains a complete selection of tools for in-the-field troubleshooting, service, and repair of CPUs, desktop computers, high-speed

The JTK-76 Computer Systems Maintenance Kit from Jensen Tools.

The AR-200XL antenna rotor from CMC Communications.

printers, and word processors. The JTK-76 kit features long-bladed screwdrivers, a 7-inch extension blade for use with the selection of nutdrivers and hexdriver blades, a penlight, and complete sets of combination wrenches, socket wrenches, measuring tools, pliers, cutters, soldering equipment, and more. The tools are contained in a deep injection-molded attache case with two removable pallets and ample space in the bottom for additional tools, test meters, or other equipment.

For more information or for a free catalog of Jensen's full line of hard-to-find tools, service kits, cases, and test equipment, write *Jensen Tools, Inc., 7815 S. 46th Street, Phoenix AZ 85040; (602)-968-6231.*

ANTENNA ROTOR FROM CMC

The AR-200XL rotor from CMC operates on 115 V ac and provides 220 in.-lb. of motor torque to turn an antenna array or surveillance camera. Full 360-degree rotation is achieved in 60 seconds. Motor voltages are held below 18 V ac for safety and only 3 conductors are required between the control unit and rotor. This keeps the system very economical through simplified design and ease of installation. The control unit incorporates a demand-heading control and a present-heading indicator presented concentrically on a compass rose. The new rotor, designed for medium duty, will support a vertical load of up to 100 pounds with a wind loading of 5 square feet.

For further information, contact *CMC Communications, Inc., 5497 Jetport Industrial Blvd., Tampa FL 33614; (813)-885-3996.*

PROTECTION GUIDE AND CATALOG

Electronic Specialists is offering a 40-page color catalog describing power-line problems such as noise and high-voltage spikes. Typical communication interference problems and suggested solutions are included, and hundreds of protective and interference cure products are described. Request Catalog 851 from *Electronic Specialists, Inc., 171 S. Main St., PO Box 389, Natick MA 01760; (800)-225-4876.*

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For a free copy, write to *The Antenna Specialists Co., 12435 Euclid Ave., Cleveland OH 44106.*

SANTEC ST-200ET AND ST-400ET

Encomm, Inc., has introduced the Santec ST-200ET and ST-400ET hand-helds to the American amateur. The radios are designed as work-alikes of the popular ICOM IC-2A and IC-4A, and most ICOM accessories are usable on the Santec HTs. The units are backed by Encomm's two-year extended-service plan and may be serviced at Encomm's facilities in Plano, Texas.

For further information about Santec's new line of handie-talkies, contact *Encomm, Inc., 2000 Avenue G., Suite 800, Plano TX 75074.*

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AUSTRALIA

Kirsti Jenkins-Smith VK9NL
PO Box 90
Norfolk Island
Australia, 2899

NORFOLK ISLAND

Except for radio amateurs, not many people in the world have ever heard of Norfolk Island. 3 × 5 miles, Norfolk Island has a resident population of some 1600 persons, seven of whom are licensed amateur-radio operators. At present, Jim VK9NS is working in Papua New Guinea (P29JS), so Norfolk Island is not heard from nearly as often as it used to be. John VK9JA, the longest standing call here, goes on the band to give weather information to yachts in the area. Mick VK9NW has an occasional rag-chew, Les VK9NI, ditto, Bob VK9ND sometimes works into the USA, preferring a chat with each contact. The only YL on the island, I am the only one active on CW these days.

In spite of the relatively small active amateur-radio population, Norfolk Island is remembered for its role in organizing the first-ever expedition to Heard Island fully and solely organized by amateur radio.

Heard Island is the "forgotten island," Australia's westernmost territory, on the fringe of Antarctica. Norfolk Island is Australia's easternmost territory, 900 miles out in the Pacific Ocean. 6300 miles, as the crow flies, separate these two islands. (Much more when considering the crooked ways man must travel.)

There is no need to deliberate on the amateur-radio expedition from Norfolk to Heard Island. It has been adequately covered in *73* in July, 1983. Suffice it to say that the expedition was not the end of an organization. Far from it. The Heard Island DX Association formed an international club of keen DXers who work together to promote amateur radio and DXing generally. The club now has 120 members from 25 countries, based on tiny Norfolk Island. President is Jim Smith VK9NS, temporarily P29JS, originator and founder of the club.

Jim also started the now famous 14.220 net during his previous stay in P29-land. The net moved from strength to strength, 280 countries having checked in at some time or other by the time Jim moved to Norfolk Island. He continued running the net from here, and so it came about, in good propagation, that Norfolk Island became the focus of world attention for a couple of hours each day. No mean feat for an island so few have heard about.

Conditions these days are, as we all know, poor. Especially from the Pacific into USA. 40-meter CW is just about the only possibility from Norfolk Island in that direction. However, there are days when the odd USA station surprises us with good signals checking into the 14.220 net. Not often, and not many, but it happens.

The bulk of Norfolk Island is a plateau on top of the 200–300-foot cliff surrounding most of the island. This is where the residential areas are. We have no congestion of houses or high-rise buildings to block radio signals. What we call "the mountain"—Mt. Bates, 900 feet above sea level—is tucked neatly out of the way, not obstructing anything. Thus Norfolk Island lends itself to amateur radio as well as such holiday activities as photography and basking in the sun, etc.

In reasonable conditions, 100 Watts and a dipole can give amazing results. 100 Watts and a beam is ample even in today's conditions. 150-foot-high Norfolk pines are ideal for anchoring an antenna. (Some people do actually climb these giants, though most often to saw the tops off for aviation safety's sake.)

The six amateurs on Norfolk Island have not found any need to form a club. We go on the bands and do our own thing. License requirements are the same as in Australia, licenses being issued by the Australian Department of Communications.

BRAZIL

Gerson Rissin PY1APS
PO Box 12178 Copacabana
20000 Rio de Janeiro, RJ
Brazil

As most of you know, my first home QTH was the city of Recife, located in the northeast part of Brazil. I was born in that city and there I got my first license in 1965, which was PY7APS. With this callsign I operated up to 1972. During that period of time, I went twice to Fernando de Noronha Island for DXpeditions. In 1967, my callsign was PY7APS/0 and in 1968 my call was PY0APS. The last time I returned to the island was in 1979; I used the same PY0APS callsign.

Since 1972 I have been living in Rio de Janeiro City with the new license, PY1APS.

Due to its geographical situation, Recife is the last point on the way to the rare spots in the Atlantic Ocean along the Brazilian coast. Because of that, a few PY7 stations were able in the past to activate DXpeditions on Fernando de Noronha Island and especially the first and second DXpeditions on St. Peter and St. Paul Rocks.

Attributable to my job, I go to Recife every two months. During these opportunities I have the chance to visit my parents and relatives, and when I have free time, I visit my friends, the DX gang of Recife.

Two months ago I met Bart PY7AKW who also operated many years ago on Fernando de Noronha Island while living on the Brazilian army base on the island. Bart was also one member of the group in the first and second DXpeditions to St. Peter and St. Paul Rocks. His call both times was PY0SP. He was a very active DXer in the past, but in the last fifteen years he has been very busy with his duties as Colonel of the Brazilian Army and as an English teacher at night in a high school in the city of Olinda. He'll be retired at the beginning of 1985, and after that he expects to be active again.

Last week I was in Recife again, and this time I was able to join three good friends: Fred PY7ZZ, Andre PY7CW, and Jim PY7BXC. Between one piece and another of lobster (the ocean in that region is rich in lobsters) or beer, I found that we all already were, for a few days, a PY0 station. So it was a good idea to have a picture with all of us. Andre gave his camera to our waiter, who took the picture.

We all operated from Fernando de Noronha Island, and among us PY7BXC was the only one who operated also from St. Peter and St. Paul Rocks.

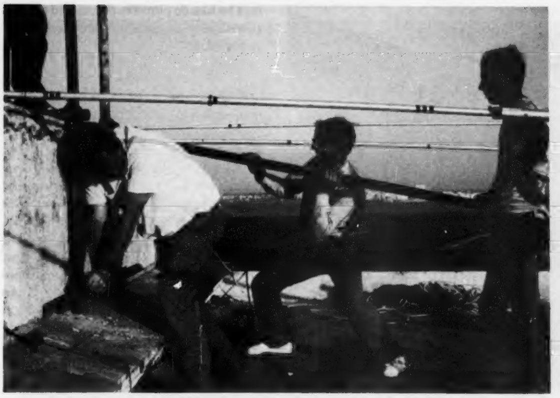
Fred PY7ZZ is one of the most active DXers of Brazil. He got his license in May, 1969, as PY7AZQ and then he changed his call to PY7ZZ. His father, Mario PY7EC, was also very active in DX at the time of the AM transmissions. Due to his job as a philologist, Mario doesn't have time enough to be as active as he was earlier. Fred is a DXCC Honor Roll member and his score now is 312/323. He was the second station in the state of Pernambuco to reach this level (I was the first).

Fred also acheived the 5BDXCC and is finishing now the 5BWAZ. He needs only a few zones on eighty meters. Fred likes contest and QRP operation on the ten-meter band. With his seven-Watt PEP equipment (a modified CB), he worked 230 countries on 10 meters. He uses a Drake 4XC and R4C, a Yaesu FT-201, and a Brazilian linear amplifier, MAC L 2000. The antennas are a three-element yagi for 10, 15, and 20 meters and dipoles for 40 and 80.

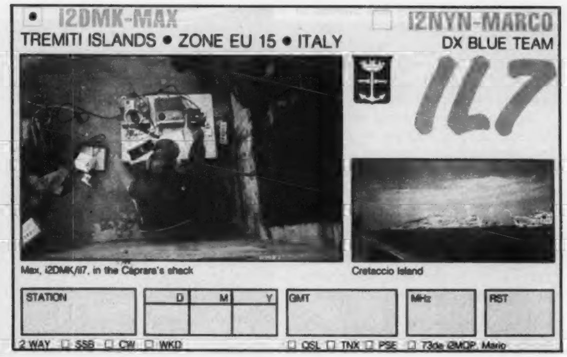
Next time I'll try to get in touch with more friends.

Left to right, Jim PY7BXC, Andre PY7CW, PY1APS, and Fred PY7ZZ.

Bart PY7AKW (left) and PY1APS.



An ID7 native watches while I8YUZ and I8TSL (right) erect antennas.



● I2DMK-MAX ☐ I2NYN-MARCO

TREMITI ISLANDS ● ZONE EU 15 ● ITALY

DX BLUE TEAM

IL7

Max, I2DMK/IL7, in the Caprara's shack

Cretaccio Island

STATION	D	M	Y	GMT	MHz	RST

2 WAY ☐ SSB ☐ CW ☐ WKD

☐ QSL ☐ TNX ☐ PSE ☐ 73de I2MQP Mario

ITALY

Mario Ambrosi I2MQP
Via Stradella, 13
21029 Milano
Italy

EXPEDITIONS

Recent months and the summer of 1984 have seen a lot of activities from Italian amateurs. As we do not intend to bother you too much with stories that are more or less always the same, we will only show you pictures. They will give you a better idea of the situation.

First, the ID7 expedition and the photo of the job of mounting the antennas. Left is an ID7 native very interested in what was happening on his island. The other two, much more involved in the job, are I8YUZ and I8TSL. The QSL card is of the I2DMK and I2NYN expeditions to IL7. QSL cards for IL7 and 4U1ITU via I2MQP. In any case, all contacts have already been confirmed via the bureau and the first ones sent to the ARRL have been the ones for many contacts we had with the States on 40 meters, the only band where the propagation was good.

PROPAGATION

With ten meters dead and fifteen very noisy and closed for most of the day, the traffic to the US is now diverted to twenty meters. But this band closes very early during winter and the only possibility to have some activity after 8:00 pm is to go on 40 and 80.

While 80 is preferred for local traffic, as we are limited to the use of a small portion of it between 3613 and 3667, 40 meters is more suitable for DXing. Beautiful propagation has been found during the Christmas period between 0300 and 0700 UTC with a lot of stations from zone 3 coming to Europe with signals strong enough to work them with a simple dipole. I do live in a flat and use a simple dipole, but a few hundred meters from here a good friend of mine, Massimo I2DMK, for whom I am the QSL manager when he goes on an expedition, has just mounted a 4-element KLM monobander for 40 meters. I have often stopped in front of his QTH to give a look to the monster, but let me say that it does not seem to be so big on top of an 18-meter tower that is on top of a 10-story building.

The results from this antenna, with the help of a Henry 3K and the CW skill of I2DMK, are impressive. I do not copy many of his correspondents, but if he is not joking there are hundreds of 0, 6, and 7 calling. Wish I could do something like that!

But you can work the Pacific Coast with a simple sloper. It was a surprise to a local CW man, I2CZ, that he received the reply of Steve AA6AA while calling CQ at 7005. It was 1500 UTC the first of January; Steve has confirmed he was working via long path and passed me wishes for a happy 1985. It was a nice contact for I2CZ and a nice surprise for I2MQP.

ARI INTERNATIONAL CONTEST

If you like to work contests and for awards, here is something for you. the Italian contest is becoming international and is offering you the possibility to get the Italian Provinces Award. See details in the box.

RADIORIVISTA

It's the name of our national radio magazine and it has presented during the last two issues some interesting topics.

One was a long article on a mailbox that was based on the Commodore 64; the full program was presented with several pages of explanation. A version of the same but using the AMTOR has been implemented and installed and working for a few months. Should somebody be interested in it, the microcomputer manager of ARI, I0FLY, is at your disposal.

Another issue covered was the problem of getting QSL responses. I wrote about it, and from my statistics it has appeared that amateurs in different countries are replying in different ways. If you work an HB station, you have 71% chance to get a reply in a reasonable amount of time. It's the same for a PA, but it goes to 68% for a JA. Italians do not reply very much to other Italians (only 31%) but it's certainly different for US stations.

Looking at others, you can see great differences: Y2—70%, LX—54%, OK—56%, SM—55%, YO—45%, but look at TG—0%, TI—10%, YS—0%, 6Y—0%, CO—7%, HP—8%, HR—0%, and JY—0%.

This was based on 30,000 cards (sent via bureau) during the period 1977 to 1983 inclusive. Maybe the situation will improve. May I present to you how the situation is for the States?

Contacts confirmed with a QSL card: W1—27%, W2—32%, W3—35%, W4—37%, W5—34%, W6—31%, W7—34%, W8—41%, W9—38%, W0—35%, KL—26%, KH—33%, and KP—20%.

Not too bad, but there is still a lot of space to improve, and I hope you *will* improve; otherwise, my awards are lost.

Always talking about cards, a full page in the magazine has been reserved for N7RO and his DX QSL Service, while a page and an half was reserved for W3HNK (half a page more than N7RO as Joe is half Italian!).

See you in a couple of months, guys, and remember, if you do pass through Italy, you are always welcome here.

ARI INTERNATIONAL CONTEST

DATE: From 1600 UTC Saturday, May 18, 1985, to 1600 UTC Sunday, May 19, 1985.

World amateur radio must contact Italian stations including San Marin, Vatican City, and SMOM.

CLASSES: Single operator CW, single operator SSB, single operator RTTY, single operator mixed mode, multi-operator single TX, SWL. Multi-operator station can use all modes (CW, SSB, RTTY).

BANDS: 28, 21, 14, 7, 3.5, and 1.8 MHz

EXCHANGE: RS(T) + QSO number starting with 001. Italian stations will send RS(T) + QSO number + two letters (province).

QSO POINTS: For European stations, 2 points for every QSO with an Italian station. For Extra-European: 4 points for every QSO with an I station.

MULTIPLIERS: 1 multiplier for every "province" per band. San Marino, SMOM, Vatican City, and the memorial Marconi stations IY1TTM and IY4FGM are additional multipliers.

FINAL SCORE: The sum of QSO points from all bands times the sum of the multipliers from all bands.

LOG: Must contain date, time in UTC, band, mode, call, exchange, score, and new multiplier. Use separate logs for each band.

Include a summary sheet with your callsign, class of participation, QSO points and multipliers on each band, and final score.

Don't forget your full address, your rig description, and your comments. Log must be mailed within 40 days from the end of contest to: Giorgio Beretta I2VXJ, via Sciesa 24, 20135 Milano, Italy, or Contest Manager, c/o ARI, via Scarlatti 31, 20124 Milano, Italy.

PENALTY: Log without a summary sheet and a declared score will be used as control log. A declared score 5 percent more than the actual score means disqualification.

AWARD: Special awards will be issued to the top five of every class of participation. A certificate will be awarded to the top scoring operators in each country and for each category.

WAIP: The Worked All Italian Provinces Award is issued to all amateurs for contacts with 60 different provinces. This will be issued upon a written application in the log and a separate list of QSOs for the award. QSL cards are not required for contest QSOs. Thank you for your participation.

Contest Manager I2VXJ
(Giorgio Beretta)

MOZAMBIQUE

Charles E. Martin AB4Y
American Embassy Maputo
Department of State
Washington DC 20520

The views and opinions presented are my own and not necessarily those of the State Department or the US Government.

Which country in Africa has the longest coastline? Well, Trivial Pursuit buffs, it's Mozambique. Mozambique is a large (twice the size of California) country located in southeastern Africa. The capital and largest city, Maputo, is located in the extreme southern end of the country on Maputo Bay. The city is quite lovely, with an abundance of foliage, trees, and attractive parks. My home is an upstairs apartment with a red tile roof. The downstairs neighbor is Len Keating KA3NJY.

Amateur radio is currently suspended in Mozambique. There has been no operation since 1976 (according to Lars Dahlgren SM0DQE, also a resident of Maputo). Conditions now are available, however, for the return of amateur radio. Like many other developing countries, Mozambique is poor. There is also a shortage of trained technicians. There is an ambitious program underway to improve the education of the population.

With such a large country, telecommunications is a challenge. The government of France has provided a substantial amount of aid towards the country's ambitious goal of improving communications services. A Swedish concern is providing new telephone equipment in Maputo and also assisting in the training of local technicians. There are nearly 800 Swedes in Mozambique. Mozambique does have a television station which broadcasts 4 hours per week, only on the weekend. In Maputo, many individuals can receive television signals from 3D6 or ZS.

The local expatriate hams have joined together and created the Maputo International Amateur Radio Association (MIARA). The chief goal of MIARA is to get amateur radio reestablished in Mozambique. Our first guest speaker at our first meeting was Milheiro Ferreira CT1BF, the director of the international cooperation bureau of the Portuguese telecommunications authority. His feeling was that the outlook for the return of amateur radio to Mozambique is very favorable. Other individuals who were present also shared his optimistic viewpoint.

Another guest was Eduardo da Motta, a Portuguese instructor of electronics who is employed at Eduardo Mondlane University in Maputo. He was very enthusiastic about the possibility of reactivating the club station at the university. He was shown some reports of the activity at BY1PK and YI1BGD and he was impressed.

Amateur radio exists to serve mankind, and a challenge exists right here in Mozambique. The international amateur-radio fraternity could help provide the equipment and technical materials to assist the country in realizing its ambitious goal of improved telecommunications.

MIARA is planning a DXpedition to the islands of Juan de Nova and Europa during the summer of 1985. (This is the *winter* of 1985 for us in the southern hemisphere.) The scientific attache at the French embassy here is providing assistance in the form of landing permits and licensing and translation. Kjell SM7DZZ owns a 40-foot sailing craft (don't ask me what kind it is; all I know is that it floats) and he is willing to provide transport for us. We are researching the awesome logistical problems inherent in such a venture. The islands have no potable water supply so we must carry our own, and that will be 3 gallons per man/day. We must carry our own electrical power. We discussed taking along a non-ham to assist, but due to the supply problems we decided to forego this luxury. I have been advised that the greatest need is for 40/80-meter CW and also that 160 is needed as well. We will try to tailor our schedule to meet the greatest need.

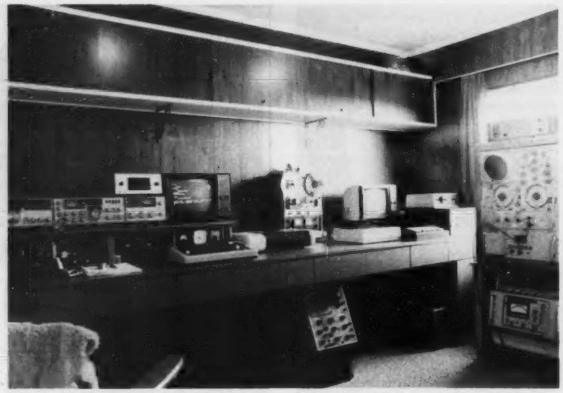
I will be traveling to Dayton for the 1985 Hamvention. I am hopeful that amateur radio will reappear in Mozambique before I make the journey.

NEW ZEALAND

D. J. (Des) Chapman ZL2VR
459 Kennedy Road
Napier
New Zealand

Kia ora atu i Aotearoa. In a previous column, I made mention of the unique ZL station, ZL6IW, the NZART Official Monitoring Service station operated by Bob Knowles ZL1BAD, of Tuakau, near Auckland. Bob is also the IARU Region III Monitoring Service Coordinator, as well as the ZL coordinator of our Intruder Watch service (monitoring service).

The special callsign, ZL6IW, is not permitted for normal use on the amateur bands but is used expressly to make contact with non-amateur stations intruding into our exclusive sections of the bands.



The shack at ZL6IW.

Bob is assisted in his monitoring work by several ZL amateurs who regularly monitor the bands from their home QTHs and forward written reports to the Monitoring Service on a weekly/monthly basis. Our regulatory body, the New Zealand Post Office, recognizes the importance of the work Bob and his helpers do, hence the reason for the special callsign allotted to the official coordinator for his use in intruder situations. This month I am including a report and photograph by Bob about the station, through the courtesy of *Break-In*, NZART's monthly magazine. The photo is of the operating position, and the gear is described in the text.

ZL6IW

The requirements of the Monitoring Service have dictated the assembly of a station equipped to handle many of the non-amateur signals now appearing within the amateur bands. It is apparent from questions asked at meetings and on the air that there is some interest in this station, so, for those readers who enjoy a visit to the other guy's shack, here is a rundown on the shack at ZL6IW.

The "great hulking beast" on the right in the photograph is a Marconi HF spectrum analyzer; those aspiring to Olympic weight-lifting events are welcome to train on this one—its weight is 305 pounds. On the top of that is a modified Pye VHF receiver, used for checking the 2-meter band. Below the beast is a Dymek scanning receiver—0.5 to 40 MHz—and under that is a Hewlett-Packard audio spectrum analyzer. Tracking left in the photograph, next is the SWTP 6809 computer with its twin disk drives, monitor, and printer. This unit is used for record handling and sorting, etc., but slowly (as software is written) moving into signal analysis.

To the left again is the main tape recorder, used for long period monitoring—other recorders are in the drawers under the bench and coupled to the receivers. The flat-looking object in front of the tape recorder is a Burroughs FAX machine modified for 60, 90, 120, 180, 300, and 360 rpm in either AM, FM, or CCITT modes. It also comes in handy for checking on the weather. Left again, is the TONO 9100E with its PSU and monitor. This unit is probably used more than any other item in the shack, especially on commercial RTTY. Next is the Yaesu FT-107M with its various auxiliary units, on top of which is a Dymek audio filter. Finally, to the left is a wide (very) band FRG7 receiver. Not shown (they didn't make the lens angle of Bob's camera wide enough!) is the frequency-measuring department. Under the bench is a Marconi HF dual beam scope, used mainly for the determination of "simo-sync" problems with harmonic and spurious RTTY signals.

This assortment is fed with a modest antenna array consisting of two-element quads, longwires, dipoles, etc. Some phased Beverage antennae are under construction. Unfortunately, Onewhero (where Bob lives) does not have sufficient flat land upon which to erect some more sophisticated specialized receiving antennae, but the arrays he has do him very proud, and provide NZART with an excellent Monitoring Service station.

*Vern Haig ZL4JN works another JOTA station from St. Patricks Hall, Dunedin. Listening in are Kylie Fraser of St. Patricks Guides (left) and Nicholas MacKechanie of St. Patricks Cubs. (Photo—*Otago Daily Times*)*

JOTA

Also from the same issue of *Break-In* is information on the 27th Scout Jamboree On The Air from Jim Parnell ZL2APE, National Organizer for the Scouts in ZL.

The 27th International Scout Jamboree On The Air was held over the weekend of 20/21 October, and as it was a long holiday weekend in New Zealand it was not surprising that Scout camps seem to have been the main feature of JOTA this year. Also Labor Weekend, the weekend concerned, is considered the start of the camping season here in ZL, even though the weather is sometimes a little suspect so early in the season. The weather this year was fairly kind for the two days of JOTA, although the holiday Monday was not too good.

Despite generally poor band conditions, there were many good contacts, and being able to work right up to midnight on the Sunday was a bonus (no school the next day because of the holiday). In past years, the cutting off of the activity at mid-day Sunday, whilst the rest of the world was in full swing, always seemed a pity.

Some band openings allowed a few contacts with Europe, however most DX was with countries around the Pacific. The aggregate score of countries for all New Zealand stations was only 20% of DXCC.

To get an electrically quiet area, Hugh ZL2BHK went deep into the hills to the west of Upper Hutt, Wellington, with an FT-101, 150 Scouts, and their leaders. Spurning the luxury of an engine-alternator for power, (actually he didn't like the cost of gas for the 48 hours running, gas presently being about $4.00 per gallon) he borrowed the car batteries of every vehicle in sight or which visited the Camp. As a result, push-starts became the norm for starting the vehicles again!

It was good to be able to meet once again so many friends of past JOTAs, especially the Rarotongan Scouts at ZK1BS. These boys found themselves in great demand by JOTA stations everywhere. After 36 hours of operating from Rarotonga, they had made 57 contacts, and were even able to use their native tongue when working ZL2AYZ at a camp near Johnsonville, near Wellington, as a Scout leader at that camp was an expatriate of the islands. Through him, they told the New Zealand boys one of the legends about how the Cook Islands came into being.

The antenna at the Johnsonville Camp performed well—as it should when supported by a Scout-constructed tower. However, their best DX was a JOTA station in Venezuela. Unfortunately they missed the opening into Europe.

Vern ZL4JN, operating at the St. Patricks Scout Hall in St. Kilda, Dunedin, had a visit from the local newspaper, the *Otago Daily Times*; see photo.

Every Jamboree On The Air is, in its own way, successful, in that it gives Scouts and Guides who are taking part an opportunity to share in their international friendships that are basic in their movements. These opportunities are all too few because of time, cost, and distance factors, factors which largely disappear with the aid of amateur radio. JOTA also introduces Scouts and Guides to the hobby of amateur radio with the result that some will gain their own amateur licenses at some time in the future. The exposure can be only of benefit to amateur radio, whose "greying" membership is of concern here in ZL.

However, the now-and-again coinci-

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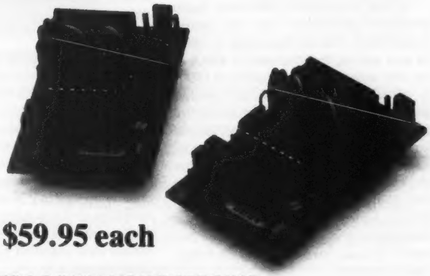

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VISA

dences of JOTA and ZL's Labor Weekend is unfortunate, as on these occasions when the two events do clash, participation is much lower than normal because of holiday weekend commitments. This year, the number of ZL stations was down by 25%, and even with the great help of JOTA Camps numbers of participants were down to about 45 percent. Actual ZL figures were about 104 stations and 2700 Scout and Guide participants. Worldwide figures are anybody's guess—last year there were about 300,000 Scouts and Guides from 100 countries taking part.

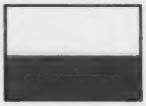
Next year's JOTA will be held 19/20 October, the weekend before our New Zealand holiday weekend, so there should be an increase in ZL JOTA stations, but they will have to close down earlier as the children will have school as usual on the Monday.

NZART ANNUAL CONFERENCE

Some information for the traveling amateurs: NZART's Annual Conference next year is being hosted by the Christchurch area (ZL3-land) and is aptly named the Garden City Conference. The Conference will cover the days of our Queen's Birthday Weekend, 31 May to 3 June, 1985. The venue for most of the activities will be the Student Union building of the University of Canterbury in Christchurch. For further information, please write direct to the Conference Committee, PO Box 29-040, Fendalton, Christchurch, New Zealand. The weekend's activities, besides the Conference, include forums, social functions, a convention dinner, fox hunts, a mobile rally, trade displays, and all the fun of similar events in your country.

Old-Timers Club 50-year certificates were awarded recently to Derek Thomson ZL1KB, John Mackie ZL2JT, Gordon Bowman ZL3BH, Stan Cook ZL2QQ, Bill Masters ZL2LY, Gordon Crocker ZL1KR, and Stu Murray ZL1KS; 60-year certificates went to Eric Beale ZL2AT and Noel Gardiner ZL2BNI.

It is with regret that I have to report the following Silent Keys over the past couple of months: ZL3UD, ZL2JF, ZL1HW, ZL4IB, ZL3ABX, and ZL1AHX.



POLAND

Jerzy Szymczak
78-200 Bialogard
Buczka 2/3
Poland

TRANSITIONS

The first President of the Polish Radio Amateurs Association, Prof. Dr. Janusz Groszkowski, died on September 3, 1984. He was elected the President of PRAA at the first constitutional congress of PRAA in February, 1930. During the second world war he deciphered the radio-control system of German missiles. Prof. Janusz Groszkowski was decorated with the Honorary Award of PRAA, No. 1, and bore the title of Honorary Member of the Association. The architect of Polish radio engineering, a member, and in 1963–1973 the President of the Polish Academy of Sciences, he was always an ally of Polish radio amateurs.

The Vice-President of PRAA in charge of technical matters, Jerzy Niewada SP7HF, has died. At a meeting of PRAA it was decided not to appoint anybody to that post. The Technical Commission of Headquarters takes over responsibility for technological progress and new projects.

The Vice-President of PRAA in charge of organization matters, SP4BBU, has resigned but he continues in the Presidium. Wiktor Chojnacki SP5QU took over the duties of SP4BBU.

In the last report the discussions about the adoption of a new statute of PRAA were mentioned. Debaters at district conventions of PRAA expressed positive opinions of the existing statute. However, the Organization Commission of Headquarters of PRAA put forward an initiative of the statute modifications at a meeting in July, 1984, for later action by the National Congress.

Drafts of a new order of the Ministry of Communications relative to amateur radio's communications service and new directions of State Radio Surveillance were discussed at the meeting of Presidium of PRAA. Remarks on the documents were sent to Legal Department of the Ministry of Communications. New hopes or new stresses?

District Verification Boards ended their activities. Till 22 June 1984, 4586 individual licenses (60% of number from before 13 December 1981) and 410 permissions for club stations (50%) were handed over. Former hams that arrive at a decision to return to the ether must submit an application as if making a request for the first time.

After a time lag of several years, the interdepartmental Club of PRAA in Jaroslaw organized the sixth meeting of Polish radio amateurs. 90 Polish hams from different parts of Poland, mainly prize winners of this year's Radio Amateurs' Activity Days, could become personally acquainted with each other—without the medium of radio waves. The following winners of Activity Days were honored with cups at the meeting: Jan Switalski SP8MJ, Jaroslaw Plesnik OK2BSP, Club SP8BVK from Zamosc, Club SP8KAR from Rzeszow, Stanislaw Stuliglowa SP8BVK, Henryk Jaroszek SP5XD, and Andrezej Merker SP-0176-WA. The current problems of common interest of Polish hams, namely organization and publishing dilemmas, were placed on the agenda. Commodity exchange had a great vogue. Organization of the meeting that took place in July, 1984, came up every minute. It's an ill wind that blows nobody any good!

PORTUGAL

Luiz Miguel de Sousa CT4UE
PO Box 32
S. Joao do Estoril 2765
Portugal

Hi folks!

Our local administration has been promoting periodic meetings with a few ham associations in which were discussed several interesting matters for the ham service in general. During the past months, the subjects discussed were mainly around the VHF and UHF repeaters, considering the IARU recommendations. The committee took into account the deficient coverage of the existing repeaters; in order to clear this complicated system, we should have installed more regional and local repeaters.

Another interesting thing is the issuing of callsigns in the future. They will be given according to the category of operator as well as the living area, or postal code. For example: Class A—prefix CQ, Class B—prefix CR, Class C—prefix CS, Class D—prefix CU, and Macau (ex CR9), prefix XX. The owners of current calls may keep them if they like.

Following the first two letters, we will have a number that corresponds to the first digit of the postal code (except for the ones in the Azores, CT2, and Madeira Islands, CT3, where the numbers are the same). Hams in Macau have already had the XX9 call for some time.

The *Portuguese Radio Amateur's Callbook* for 1985 was distributed free of charge to all licensed hams in this country. It happened last January. On this project were involved several Associations (such as those from Beira Alta, Amadora e Sintra, Estoril, and Algarve), some private companies, and, finally, the local administration who supported the mail charges and gave the update addresses for the *Callbook*. The editor is Nelson Alves CT1MV. In this useful book are listed all the resident hams in Portugal CT1/4 (mainland), Azores CT2, and Madeira CT3.

With easy access to microcomputers, the two modes of RTTY and SSTV are not as complicated as they were some years ago. (No one could sleep when I had my old Teletype Mod. 15 on receive mode—hi.)

So, in the DX frequencies, you may hear a few CTs on RTTY and SSTV, using microcomputers and interfaces. The most popular computer that we have is the Sinclair Spectrum (assembled here), but we also have the Dragon, Texas TI99/4A, VIC-20, and Commodore C-64.

I've just received an interface AIR-1 for my C-64, and I'm rather active, too. If you hear me, give me a call and I will buy you a drink when you come over to Portugal.

That's all folks, until next month.

SWEDEN

Rune Wande SM0COP
Frejavagen 10
S-155 00 Nykvarn
Sweden

SM5LN—SILENT KEY

Martin Hoglund SM5LN died in Stockholm on December 21, 1984, after a few months of illness.

Martin devotedly and voluntarily did most important work for the Swedish radio amateurs. During the last 25 years, he was a staff member of the Swedish amateur radio league, SSA. Over the last 20 years he was in charge of both the SSA office and the league's finances. This work is not very glamorous but of the utmost importance. Martin did all this work for SSA in his spare time.

Martin was born in 1920 on the island of Gotland (SM1) but lived most of his life in the city of Stockholm where he was employed by the Ericsson Radio Systems AB. On the radio, he was mostly on the 80-meter band chatting with local friends. Other interests included Egyptian history in which he was notably knowledgeable. SSA and its members have lost a dedicated radio amateur and a good friend who never will be forgotten.

SSA HAM FESTIVAL

This year the SSA Annual Membership Meeting will be hosted by the club NSRA, Nordvastra Skanes Radioamatorer—SK7DD—in the town of Helsingborg on the last weekend of April. Helsingborg is one of the ports when you are leaving Sweden for the European continent. A ferry takes you to Helsingor in Denmark in half an hour. This festival will be a remarkable one. Helsingborg celebrates its 900-year anniversary, SSA its 60th, and NSRA its 40th. With all the attractions NSRA is planning for, this will be a great weekend for all radio amateurs getting together, of which many certainly will be coming from neighboring Denmark.

WASM-60 AWARD

This award is offered by the SSA (Sveriges Sandareamatorer) to celebrate its 60th anniversary in 1985. The award is available to all licensed radio amateurs and SWLs. All contacts between January 1, 1985, and December 31, 1985, are valid.

Requirements:

HF: European applicants should work one station in each of the 25 Swedish lan (counties). Non-European applicants should work one station in each of the eight Swedish call areas (SK/SL/SM: 1, 2, 3, 4, 5, 6, 7, 0).

VHF: Applicants should work one station in each of the eight Swedish call areas.

Contacts via satellite are valid but not contacts via active repeaters. Endorsements are available for single band and single mode.

Special-event stations count as jokers and each one may replace one missing lan or call area.

The award is free of charge. Verified log entry is to be sent to: WASM-60 Award Manager, Bengt Hogkvist SM6DEC, Blabarstigen 11 B, S-546 00 Karlsborg, Sweden.

Swedish lan (counties):

A	(SM0, SM5)	O	(SM6)
B	(SM0, SM5)	P	(SM6)
C	(SM5)	R	(SM6)
D	(SM5)	S	(SM4)
E	(SM5)	T	(SM4)
F	(SM7)	U	(SM5)
G	(SM7)	W	(SM4)
H	(SM7)	X	(SM3)
I	(SM1)	Y	(SM3)
K	(SM7)	Z	(SM3)
L	(SM7)	AC	(SM2)
M	(SM7)	BD	(SM2)
N	(SM6)		

HAM HELP

This is not technical, but nevertheless something this ham needs help with! For years, an old and incomplete jingle has frustrated me—I wonder if any of you readers can help complete the missing verses?

Ten Thousand Swedes
Crawled through the weeds
At the battle of Copenhagen.
< What goes here?>
Pursued by one Norwegian!

I would be surprised to hear from any Swedish folk, unless the tide of battle changed!

M. McDaniel W6FGE
940 Temple St.
San Diego CA 92106

I need any information I can get on a Monsanto 6400 A oscilloscope. I will gladly pay copying charges.

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MFJ-945, $79.95, like MFJ-940B with balun, less antenna switch.
MDJ-944, $79.95, like MFJ-940B with balun, antenna switch on front panel, less SWR/Wattmeter.
Optional mobile bracket for 940B, 945, 944, $5.00.

MFJ-900 200 WATT VERSA TUNER

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Matches coax, random wires 1.8-30 MHz. Handles up to 200 watts output; efficient airwound inductor gives more watts out. 5x2x6 in. **Use any transceiver,** solid state or tube. Operate all bands with one antenna.

OTHER 200 WATT MODELS:
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Grove Enterprises 41
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Hale, Paul, Listeners & Friends of Radio Peking 60
Ham Radio Outlet 1
The Ham Station 85
Hamtronics, NY 73
Hustler, Inc. 92
ICOM ...... Cov. II, 10, 11
Jan Crystals 53
J.I.L. (J.I.C.L.-L.A. Corp.) 31
John J. Meshna, Jr. Co., Inc. 80
Kantronics 15
Kenwood ...... 5, Cov. IV
Larsen Antennas 37
MFJ Enterprises 91
MHz Electronics 75-79
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Maggiore Electronic Laboratory 95
Magnum Distributors 27
Merrimac Satellite 60
The Metheny Corporation 13
Micro Control Specialties 81
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P.C. Electronics 51
Precision Technology 93
Radio Amateur *Callbook*, Inc. 53
Radio World 55
Ramsey Electronics 74
73
  Back Issues 37, 71
  Dealer Ad 49, 58
  Mailing List 84
  Moving 84
  Subscriptions 16, 51
S-F Amateur Radio 55
Satellite Television Magazine 23
Scientific Instruments Center, Inc. 49
Snobird Software 55
Spec-Com 13
Spectrum Communications 14
Spectrum International 41
Spi-Ro Distributors 13, 93
Ten-Tec 93
Thomson Software 55
Transleteronic, Inc. 49
Twin Oaks Associates 59
Universal Mfg. Co. 43
University Micros 47
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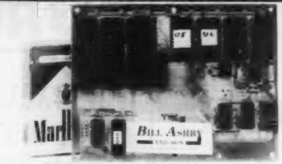

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Jim Gray W1XU
73 Staff

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ALASKA						20	20					
ARGENTINA	20	20	20	40			20	20	15	15	15	15
AUSTRALIA		20	20	20	40	40	20					
CANAL ZONE	15	40	40	40	40[1]	40		15	15	15	10	10
ENGLAND			40[1]	40			20	20	20	20	20	20
HAWAII			20		40		20					
INDIA												
JAPAN						20	20					
MEXICO	15	40	40	40	40[1]	40		15	15	15	10	10
PHILIPPINES							20					
PUERTO RICO	15	40	40	40	40[1]	40		15	15	15	10	10
SOUTH AFRICA			40	40		20	20				20	
U. S. S. R.							20	20		20		
WEST COAST	20	40	40	40[1]	40[1]	40						20

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA		20	20					20	20			
ARGENTINA	15	20	20	40			20	20		15	15	15
AUSTRALIA	15	20	20	20	40[1]	40		20			20	
CANAL ZONE	15	20	20	20	40[1]	40	20	20	15	15	15*	10
ENGLAND	20	40					20	20		20	20	20*
HAWAII	15	15	20	20	20	40	20	20				
INDIA												
JAPAN		20	20					20	20			
MEXICO	15	20	20	20	40[1]	40	20	20	15	15	15*	10
PHILIPPINES		20	20				20	20				
PUERTO RICO	15	20	20	20	40[1]	40	20	20	15	15	15*	10
SOUTH AFRICA							20				20	20
U. S. S. R.								20			20	

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA		20	20						20			
ARGENTINA	15	20	20	40	40			20	20		15	15
AUSTRALIA		20	20	20	20	40[1]	40[1]		20		15	15
CANAL ZONE	15	15	20	20[1]	40[1]	40		20	20	15	15	15
ENGLAND	20							20	20			20
HAWAII	20	15	15	20	20	20[1]	40[1]	40	20		20	20
INDIA				20					20			
JAPAN		20	20						20			
MEXICO	15	15	20	20[1]	40[1]	40		20	20	15	15	15
PHILIPPINES				20					20			
PUERTO RICO	15	15	20	20[1]	40[1]	40		20	20	15	15	15
SOUTH AFRICA			40						20			
U. S. S. R.									20			
EAST COAST	20	40	40	40[1]	40[1]	40						20

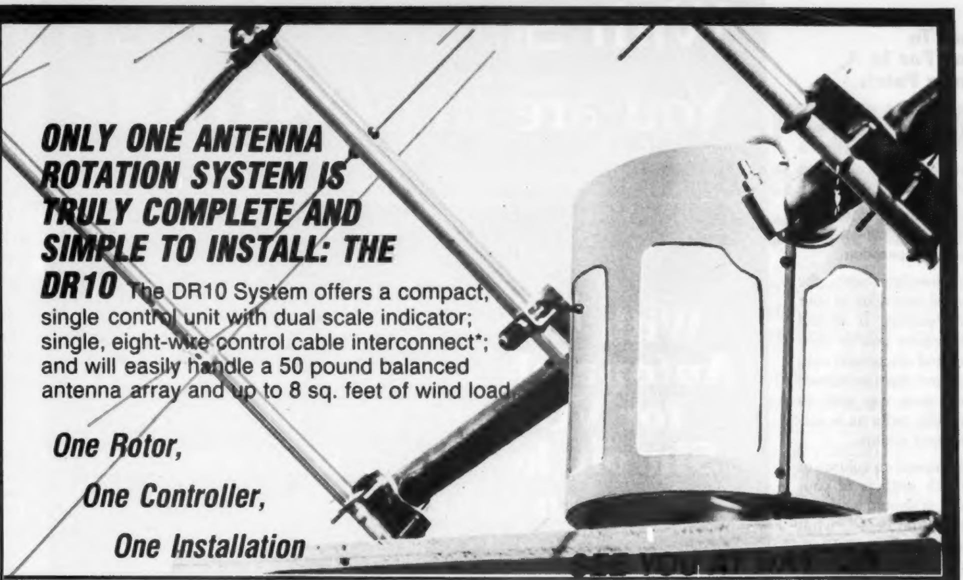
1 = Possible 80-meter openings.
*** = Check next higher band.**

G = Good, F = Fair, P = Poor.

MAY

SUN	MON	TUE	WED	THU	FRI	SAT
			1 G	2 G	3 G	4 F
5 P	6 F	7 G	8 G	9 F	10 P	11 P-F
12 F	13 G	14 G	15 F-P	16 P-F	17 G	18 G
19 F	20 P	21 P	22 F	23 G	24 G	25 F
26 P	27 F	28 G	29 G	30 G	31 G	

THE DR10



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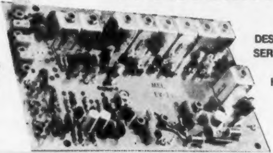

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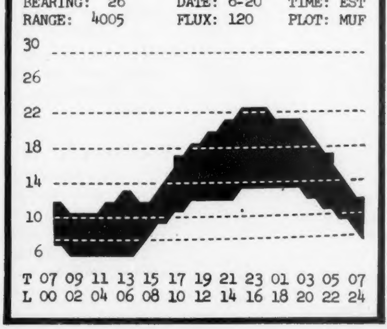

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BASE (2) SYSTEMS
2534 Nebraska St.
Saginaw, MI 48601
Tel.517-777-5613

What To Look For In A Phone Patch

The best way to decide what patch is right for you is to first decide what a patch should do. A patch should:

- Give complete control to the mobile, allowing full break in operation.
- Not interfere with the normal operation of your base station. It should not require you to connect and disconnect cables (or flip switches!) every time you wish to use your radio as a normal base station.
- Not depend on volume or squelch settings of your radio. It should work the same regardless of what you do with these controls.
- You should be able to hear your base station speaker with the patch installed. Remember, you have a base station because there are mobiles. ONE OF THEM MIGHT NEED HELP.
- The patch should have standard features at no extra cost. These should include programmable toll restrict (dip switches), tone or rotary dialing, programmable patch and activity timers, and front panel indicators of channel and patch status.

ONLY SMART PATCH HAS ALL OF THE ABOVE.

Now Mobile Operators Can Enjoy An Affordable Personal Phone Patch. . .

- Without an expensive repeater.
- Using any FM tranceiver as a base station.
- The secret is a SIMPLEX autopatch, The *SMART PATCH.*

SMART PATCH Is Easy To Install

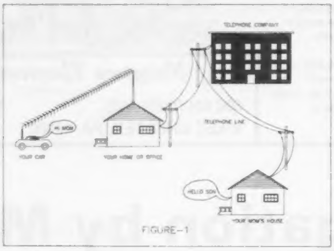
To install *SMART PATCH*, connect the multicolored computer style ribbon cable to mic audio, receiver discriminator, PTT, and power. A modular phone cord is provided for connection to your phone system. Sound simple? . . . IT IS!

With SMART PATCH You are in CONTROL

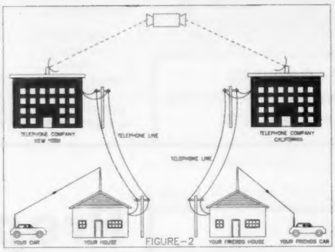
With CES 510SA Simplex Autopatch, there's no waiting for VOX circuits to drop. Simply key your transmitter to take control.

SMART PATCH is all you need to turn your base station into a personal autopatch. SMART PATCH uses the only operating system that gives the mobile complete control. Full break-in capability allows the mobile user to actually interrupt the telephone party. SMART PATCH does not interfere with the normal use of your base station. SMART PATCH works well with any FM transceiver and provides switch selectable tone or rotary dialing, toll restrict, programmable control codes, CW ID and much more.

To Take CONTROL with Smart Patch – Call 800-327-9956 Ext. 101 today.



FIGURE–1



FIGURE–2

How To Use *SMART PATCH*

Placing a call is simple. Send your access code from your mobile (example: *73). This brings up the Patch and you will hear dial tone transmitted from your base station. Since *SMART PATCH* is checking about once per second to see if you want to dial, all you have to do is key your transmitter, then dial the phone number. You will now hear the phone ring and someone answer. Since the enhanced control system of *SMART PATCH* is constantly checking to see if you wish to talk, you need to simply key your transmitter and then talk. That's right, you simply key your transmitter to interrupt the phone line. The base station automatically stops transmitting after you key your mic. *SMART PATCH* does not require any special tone equipment to control your base station. It samples very high frequency noise present at your receivers discriminator to determine if a mobile is present. No words or syllables are ever lost.

SMART PATCH Is All You Need To Automatically Patch Your Base Station To Your Phone Line.

Use *SMART PATCH* for:

- Mobile (or remote base) to phone line via Simplex base. (see fig 1.)
- Mobile to Mobile via interconnected base stations for extended range. (see fig. 2.)
- Telephone line to mobile (or remote base).
- *SMART PATCH* uses SIMPLEX BASE STATION EQUIPMENT. Use your ordinary base station. *SMART PATCH* does this without interfering with the normal use of your radio.

WARRANTY?

YES, 180 days of warranty protection. You simply can't go wrong.
An FCC type accepted coupler is available for *SMART PATCH.*

CES ®

Communications Electronics Specialties, Inc.
P.O. Box 2930, Winter Park, Florida 32790
Telephone: (305) 645-0474 **Or call toll-free (800)327-9956**

2M HANDIE TRANSCEIVER FT-209RH
-RPT
1
SIMP
2
+RPT
3
PMS
PMS
SAV T
4
T SQ
5
T SET
6
TX M
M
MSS
MR
SAVE
7
ENC
8
BEEP
9
MC
C
SHIFT
S OFF
T OFF
0
B OFF
F
STEP
D
S/PO◄►BC
CLEAR◄MAN►BUSY
►KEY LOCK
YAESU

T-209RH shown actual size.

FT-203R transceiver

The Yaesu FT-209RH. 5 watts that your batteries can live with.

Have the power you need when you need it with Yaesu's new 5-watt, 2-meter handheld. Power to get out in situations where ordinary HTs just won't make it.

We designed our HT with a unique user-programmable Power Saver that puts the rig to "sleep" while you're monitoring and "wakes it up" when the squelch breaks. So you can listen for hours and still have plenty of power to hit those hard-to-reach repeaters when you need to.

With the FT-209RH there's no need to fiddle with knobs when you change from one memory channel to another. That's because you can independently store everything you need in each of the ten memories: receive frequency, standard or non-standard offset, even tone encode/decode with an optional module. And then recall any channel at the touch of a button.

It's easy to hear what's happening on your favorite repeaters or simplex frequencies. Just touch a button and scan all memory channels, or selected ones. Or all frequencies between any two adjacent memories. Use the priority feature to return automatically to your special frequency when it becomes active.

Bring up controlled-access machines with the optional plug-in subaudible tone encoder/decoder, independently programmed from the keyboard for each channel. Listen for tone-encoded signals on selected channels—without having to hear a bunch of chatter—by enabling the decode function.

The FT-209RH, which covers 10 MHz for CAP and MARS use, comes complete with a 500-mAh battery, charger and soft case.

For those who want a basic radio without the bells and whistles, consider the compact, lightweight FT-203R. This economical HT features 2.5 watts of power and an optional DTMF keypad. Most all the accessories for the 209 work with the 203, including an optional VOX headset that gives you hands-free operation that's perfect for public service events.

So when you visit your dealer, let him know you won't settle for anything but the best. A radio built by Yaesu.

YAESU

Yaesu Electronics Corporation
6851 Walthall Way, Paramount, CA 90723
(213) 633-4007.

Yaesu Cincinnati Service Center
9070 Gold Park Drive, Hamilton, OH 45011
(513) 874-3100.

Prices and specifications subject to change without notice.

KENWOOD

pacesetter in Amateur radio

NEW!

"DX-cellence!"

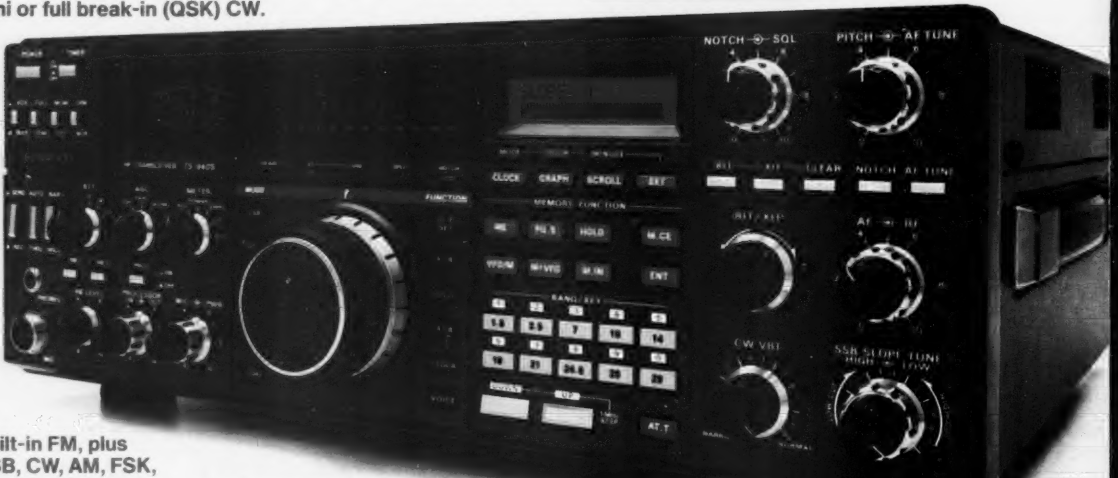
TS-940S

The new TS-940S is a serious radio for the serious operator. Superb interference reduction circuits and high dynamic range receiver combine with superior transmitter design to give you no-nonsense, no compromise performance that gets your signals through! The exclusive multi-function LCD sub display graphically illustrates VBT, SSB slope, and other features.

- **100% duty cycle transmitter.** Super efficient cooling system using special air ducting works with the internal heavy-duty power supply to allow continuous transmission at full power output for periods exceeding one hour.
- **Programmable scanning.**
- **Semi or full break-in (QSK) CW.**
- **Low distortion transmitter.** Kenwood's unique transmitter design delivers top "quality Kenwood" sound.
- **Keyboard entry frequency selection.** Operating frequencies may be directly entered into the TS-940S without using the VFO knob.
- **Graphic display of operating features.** Exclusive multi-function LCD sub-display panel shows CW VBT, SSB slope tuning, as well as frequency, time, and AT-940 antenna tuner status.
- **QRM-fighting features.** Remove "rotten QRM" with the SSB slope tuning, CW VBT, notch filter, AF tune, and CW pitch controls.

Optional accessories:

• AT-940 full range (160-10 m) automatic antenna tuner • SP-940S external speaker with audio filtering • YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter • VS-1 voice synthesizer • SO-1 temperature compensated crystal oscillator • MC-42S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • PC-1A phone patch • TL- 922A linear amplifier • SM-220 station monitor • BS-8 pan display • SW-200A and SW-2000 SWR and power meters.



- **Built-in FM, plus SSB, CW, AM, FSK,**
- **High stability, dual digital VFOs.** An optical encoder and the flywheel VFO knob give the TS-940S a positive tuning "feel."
- **40 memory channels.** Mode and frequency may be stored in 4 groups of 10 channels each.
- **General coverage receiver.** Tunes from 150 kHz to 30 MHz.

More TS-940S information is available from authorized Kenwood dealers.

KENWOOD

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street
Compton, California 90220

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories. Specifications and prices are subject to change without notice or obligation.